Union Calendar No. 199
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THE GROUND-CUSHION PHENOMENON

REPORT

OF THE

COMMITTEE ON SCIENCE AND ASTRONAUTICS
U.S. HOUSE OF REPRESENTATIVES

EIGHTY-SIXTH CONGRESS

FIRST SESSION

JUNE 10, 1959.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

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LETTER OF TRANSMITTAL

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND ASTRONAUTICS,
Washington, D.C., May 26, 1959

Hon. OVERTON BROOKS,
Chairman, Committee on Science and Astronautics.

DEAR MR. CHAIRMAN: I am forwarding herewith for committee consideration a report on "The Ground-Cushion Phenomenon," prepared by staff consultant Lt. Col. Paul B. Schuppener.

This report is based on releasable portions of testimony provided by knowledgeable witnesses representing the military departments and industry, and on information gathered from other qualified sources. It discusses the ground-cushion phenomenon itself and applications to vehicles having great potential value to military operations and to the civilian transportation industry. Certain of the applications will require a relatively small additional development effort while others, although showing considerable promise, will require not only continued applied research but a significant amount of development work.

CHARLES F. DUCANDER,
Executive Director and Chief Counsel.

LETTER OF SUBMITTAL

COMMITTEE ON SCIENCE AND ASTRONAUTICS,
HOUSE OF REPRESENTATIVES,
Washington, D.C., June 8, 1959.

Hon. SAM RAYBURN,
Speaker of the House of Representatives,
Washington, D.C.

DEAR MR. SPEAKER: By direction of the Committee on Science and Astronautics, I submit the enclosed report, "The Ground-Cushion Phenomenon," to the 86th Congress.

This report has been prepared following investigative hearings by the full committee into the status of research and development on the ground-cushion phenomenon and its future application to the improvement of land, sea and air transportation.

At a meeting of the committee this date, the report was adopted and approved for submission to the House.

Sincerely yours,

OVERTON BROOKS, *Chairman.*

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Mr. BROOKS of Louisiana, from the Committee on Science and Astronautics, submitted the following

REPORT

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THE GROUND-CUSHION PHENOMENON

I. INTRODUCTION

Kipling has said, "Transportation is civilization." The truth of these words is evident from the rapidity with which civilization has advanced under the impetus of inventions providing new means of transportation.

In the Paleolithic age there were no aids to transportation; the stone-age man walked, and if he came to a river he swam or paddled himself across on a tree trunk. In the Neolithic age he learned to make a sledge on which to drag home his freshly killed game, and he found that with fire and sharp-edged stones he could form a tree trunk into a dugout canoe. Much later, about 3000 B.C., there is evidence to indicate the invention of the wheel by the people of southern or eastern Asia. The invention of the wheel opened new vistas of trade and commerce and sped the exchange of knowledge between peoples.

Waterborne transportation gained new importance from the appearance of square-rigged sails on Egyptian vessels just before 3000 B.C. The introduction of the lateen or triangular sail by the Arabs about 600 A.D. made possible the sailing of vessels on crosswind courses and led ultimately to the design of the ships of Columbus and Captain Cook.

During the past 200 years economic progress and the spread of cultural knowledge have been particularly great. These advances can be attributed directly to a whole series of inventions within that period—the steamboat, the steam carriage (forerunner of the modern automobile), the steam locomotive, the gasoline motor-driven automobile and the first power-driven airplane, which flew successfully in 1903.

Each invention or improvement of transport vehicles has been based upon at least one of two important considerations—the harnessing of a new or previously inaccessible source of power with which to drive the vehicle, or an increase in the ease of movement through the reduction of friction. Now it appears that we may be entering an early phase of development based on a discovery which materially reduces the wasteful, retarding force of friction by allowing vehicles to roll on a cushion of air over land, sea, swamp, sand, or snow. The ground-cushion phenomenon, as it is known, if successfully harnessed, can have its important effect on the advancement of our civilization.

The Committee on Science and Astronautics, realizing the potential importance of such a development, determined to ascertain its status and possible future applications. Knowledgeable witnesses from industry and the military services were invited to testify before the full committee. Included were John B. Macauley, Deputy Director of Defense Research and Engineering, Department of Defense; Rear Adm. Rawson Bennett, Chief of Naval Research, Department of the Navy; Brig. Gen. Frank H. Britton, Director of Developments, Office,

Chief of Research and Development, Department of the Army; Dr. Andrew A. Kucher, vice president, engineering and research, Ford Motor Co.; Mr. Carl W. Bollum, Sr., president, Spacetronics, Inc.; Mr. William H. Alper, president, National Research Associates, Inc.

Certain of the Army and Air Force work in this field is carried under a military security classification and was disclosed to the committee in closed session. Only those portions deemed releasable have been referred to in this report. Information received during the course of open hearings and gathered separately from military, industry, and scientific sources are summarized herein.

II. THE GROUND-CUSHION PHENOMENON

Conventional airplanes and helicopters depend almost exclusively on aerodynamic lift produced by the rapid movement of properly shaped airfoils (wings or rotors) through the air. However, during landing or takeoff such aircraft do experience substantial effect attributable to the ground-cushion phenomenon. This transitional effect can be used to augment the lifting capacity of an airplane or helicopter by as much as 10 to 20 percent for operations a few feet from the ground. In fact, the hovering ceilings both "in" and "out" of ground-cushion effect have become design parameters of rotary-wing aircraft.

Recognition of the ground-cushion phenomenon as a primary means for support of a vehicle in the air led to the beginning of research in Europe in the late 1930's. In this country Dr. Andrew A. Kucher proposed more than 30 years ago, in 1928, the concept of a wheelless vehicle that would ride on a thin film of air a fraction of an inch above the roadbed. Work by individual investigators, and at least one major aircraft company, continued in a desultory fashion in the 1940's. The first known experimental work performed by the U.S. Government having significance for possible application to vehicles was by the National Advisory Committee for Aeronautics' Lewis Laboratory, beginning in June 1954. Results of the Lewis Laboratory experimental work were published in April 1957 in a report entitled "Exploratory Study of Ground Proximity Effects on Thrust of Annular and Circular Nozzles."

It should be noted, however, that work on one specialized application of the air-cushion phenomenon was begun for the Army by a group of German missile scientists headed by Dr. Wernher von Braun shortly after their arrival in this country in the fall of 1945. In this case, the application was most specific to the design of near-frictionless air bearings to reduce the drift or precession of gyroscopes used in ballistic missile guidance systems.

With the exception of this specialized missile application, interest of the U.S. Government stems mainly from the effects demonstrated by the Lewis Laboratory. The Lewis Laboratory showed experimentally, through use of an annular jet nozzle, that when high pressure air was discharged from the periphery of the nozzle there was an unexplained increase in reaction or lifting force on the nozzle if the exit was less than one and a half nozzle diameters from a rigid surface. This increased lift is in direct contrast to the effect experienced if the air is discharged from an unrestricted nozzle. In the latter case the thrust is actually reduced as a result of the reaction of the airstream with the ground.

The so-called ground-cushion phenomenon is attributable to certain characteristics of air. These characteristics, compressibility and viscosity, or resistance to flow, are well known to aerodynamicists and airplane design engineers. Air, forced between the bottom of a machine or vehicle and a rigid surface such as the ground, asserts its inherent resistance to compression by exerting equal and opposite pressure against the ground and the device. The upward pressure of the air on the machine, multiplied by the area against which it acts, becomes the lifting force which floats the machine on a cushion of air. Of course, lacking a seal at the edges, air escapes, but here another characteristic of air becomes important. The viscosity or internal frictional force manifested when the air begins to flow out at the edges acts to retard or limit the escape of air and to preserve a relatively stagnant region of air at the center. This appears to be an essential condition to the establishment of the air cushion. The system soon attains equilibrium, in which the machine floats at a height above the ground dictated by the rate of flow of air pumped into the space between the ground and the machine, the combined weight and load of the machine and the area of the bottom of the machine. There are other influencing factors, but these are fundamental.

Force to propel the machine is a separate problem but, because the machine can now roll on an almost frictionless cushion of air over land or water, the power requirements are considerably reduced to produce what otherwise would be considered high ground speeds and extremely high water speeds. Power to propel the machine can be provided by the conventional engine or gas turbine driving a propeller, by jet engine, or by air jet. Operating heights of vehicles varying from a fraction of an inch to perhaps 50 feet appear feasible. Vehicle speeds of more than 100 miles per hour over land, water, marsh or snow are contemplated.

The manner in which the ground cushion is maintained varies considerably with the intended use. For example, in the air-bearing application illustrated in figure 1, air escapes radially, with no attempted restraint. The height of lift is therefore rather strictly limited and the operating surface must be smooth. The use of a plenum chamber as shown in figure 2 may add somewhat to the height of lift and permit traverse of water and more irregularly formed ground. The addition of an annular jet, as illustrated in figure 3, has at least one important effect in that it forms a curtain of relatively high velocity air, directed at the ground, which tends to restrict the radial escape of air to a much greater extent than does the plenum chamber. Still another proposal utilizes a so-called labyrinth seal. In this application there are a number of discontinuous annular chambers arranged so that air is ejected as a series of oblique jets at different radii on the base of the vehicle. In this manner most of the air ejected downward is recaptured by the stages operating at greater radii from the center. The advantage of this type is possibly greater power economy.

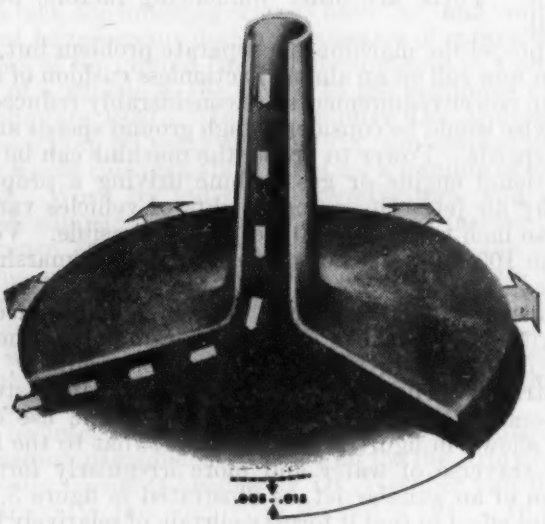

FIGURE 1.

PLENUM CHAMBER

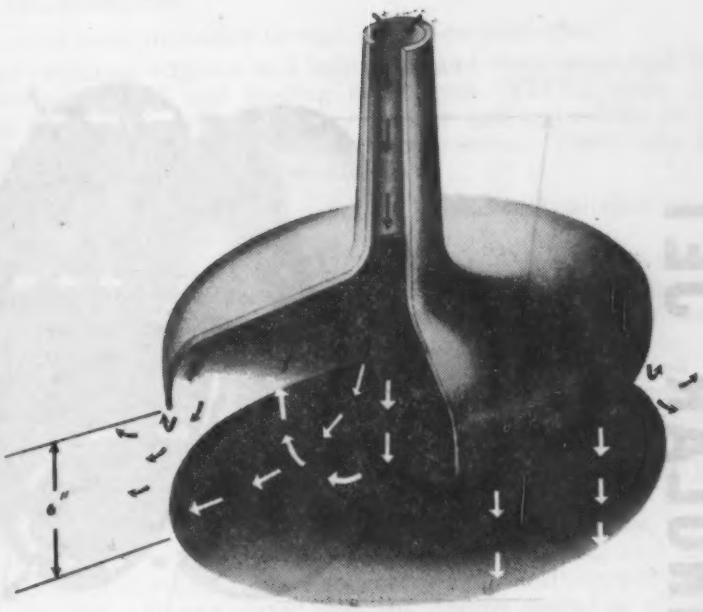

FIGURE 2.

FIGURE 3.

III. GROUND-EFFECT MACHINES

Machines or vehicles which make use of the ground-cushion phenomenon have been called ground-effect machines, ground proximity machines, minimum ground pressure vehicles and by various trade names. Dr. Gabriel D. Boehler, member of the faculty of Catholic University of America and associated with the Aerophysics Co., who has done much pioneer work in evolving and demonstrating the theory of operation of the ground-effect machine, defines it in this manner:

> A ground-effect machine is defined as a device which, at least in one phase of its operation, derives a substantial portion of its support from a cushion of high-pressure air sealed between the base of the machine and the ground. This seal can be realized practically either by means of a peripheral high-speed jet (annular jet) or by means of a "labyrinth." Operationally, the machine can be used as a truck, a ship, or an airplane.

Mr. J. B. Macauley, Deputy Director of Defense Research and Engineering, in his appearance before this committee stated that the use of the ground-cushion phenomenon by air vehicles can be classified into four categories:

Vehicles which make transition through ground-cushion effect

The conventional airplane and helicopter and their more sophisticated vertical takeoff and landing derivatives (VTOL) make the transition through ground effect very rapidly and make little or no beneficial use of the ground-cushion phenomenon. Practically all known flying machines fall in this category.

FIGURE 3.

Vehicles which operate effectively either by ground-cushion effect or by aerodynamic lift

Next is the aerial-vehicle type of VTOL aircraft. It operates within the ground cushion as a vehicle riding on air, but after obtaining minimum velocity functions as an aircraft and is supported by aerodynamic forces generated by its forward motion.

There is a joint Army-Air Force sponsored program carried on under contract with Avro Aircraft, Ltd., of Canada, to develop a VTOL research vehicle of this nature. The research vehicle, known as the Avrocar, has been identified as a disk-shaped vehicle by Brig. Gen. F. H. Britton, Director of Developments, Office, Chief of Research and Development, who testified as an Army witness. It will have a hovering capability, as do other ground-effect vehicles, but it will have high performance outside the ground cushion, and after attaining minimum velocity will function as an aircraft supported by aerodynamic lift. It was stated that the desired operating altitude will be on the order of 50 to 100 feet. This development is now in the advanced stages and it is expected that ground testing will begin in the near future. Details pertaining to the specific configuration and technical data such as the method of controlling airflow are considered classified information not releasable at this time, according to Army witnesses.

Vehicles which operate by ground-cushion effect and which may have limited conventional surface mobility

A third type of vehicle, categorized by the Department of Defense, is sometimes called a minimum ground-pressure vehicle. It operates at all times within the ground cushion over open land or sea areas.

FIGURE 3.

The movement of this vehicle is not restricted by mud, snow, ice, or other similar surface obstacles which impede the movement of wheeled vehicles.

The Navy has a number of relatively small contracts designed to further their interest in applications such as an amphibious transport or assault boat. These devices would travel 4 or 5 feet above the wave tops at speeds up to 50 miles an hour and be capable of negotiating beaches up to 15 percent slope. The Navy also has in mind the possibility of a radio-controlled antisubmarine warfare platform. It would operate at heights only great enough to clear the waves and at speeds up to 20 percent greater than the latest atomic submarine. More advanced thinking, insofar as naval use is concerned, involves a circular shaped platform up to 1,000 feet in diameter and capable of speeds up to 150 knots (fig. 4). Because of the large size such a machine might operate up to 50 feet above the waves, thus permitting maximum weight lifting potential and stability.

Several research vehicles under development by private concerns also fall into this category. Spacetronics, Inc., has its Hydro-Air vehicle, which makes use of an open plenum chamber on the under side, into which air is pumped and allowed to leak from around the bottom of the vehicle. Mr. Carl Bollum, president of Spacetronics, Inc., states that—

> We have discovered that the Hydro-Air vehicle is stable in attitude in heights above the surface of the earth up to one-tenth of its equivalent diameter and no controls are required, other than steering and throttle controls for the thrust and the air pump motor. Further development and tests will be required before the upper limits in altitude without attitude controls can be determined.

Mr. William Alper, president of National Research Associates, Inc., stated that his company has an Army contract for a feasibility study of a minimum ground-pressure vehicle which incorporates the free-air suspension system. He stated that—

> This type of vehicle employs a peripheral jet which generates and contains pressure underneath the vehicle to provide it with support. In other words, this vehicle rides on a cushion of air which is contained by an air wall.

He pointed out that the free-air suspension system vehicle will also be equipped with wheels and a lightweight suspension system in order that it may be driven in and out of buildings and along city streets and highways.

Spacetronics, Inc., and National Research Associates, Inc., are small concerns engaged in experimental work on ground-effect machines under very limited budgets. Both, with little or no funds from outside sources, have built experimental vehicles for feasibility demonstrations.

Vehicles which operate on a very thin film of air over a smooth surface

A fourth application of the ground-cushion phenomenon is represented by a vehicle that operates on the air-bearing concept, which is that friction with surface terrain is significantly reduced by a thin film of air between the surfaces of the vehicle and the support (fig. 5).

Dr. Andrew A. Kucher, vice president, engineering and research, Ford Motor Co., testified concerning a Ford development utilizing the airbearing for support. Instead of wheels the Levacar employs levapads. Tiny jets of air stream through holes in the levapads supporting the vehicle and permit it to slide at high speeds over a rail,

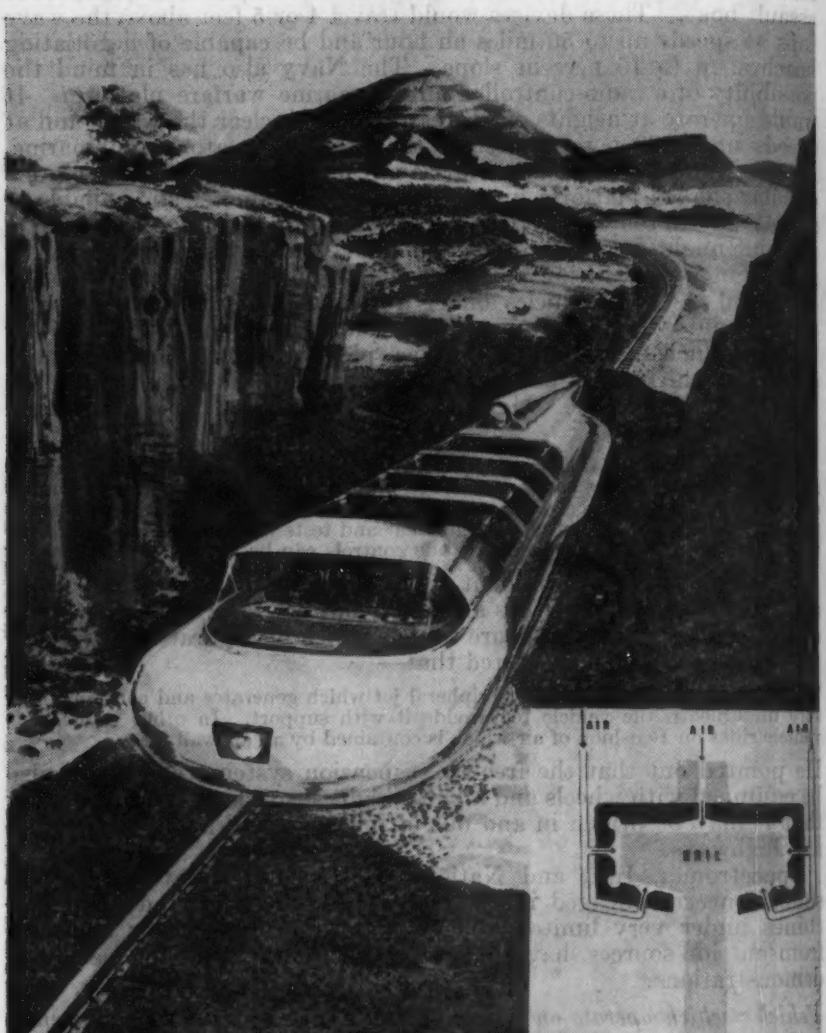

FIGURE 5.

using air as a lubricant. Because there would be no road friction to overcome, full size Levacars would be propelled either by gas turbine engines or turbojets. Engines would also supply the air to levitate the vehicle. Speeds of over 200 miles an hour appear practicable.

IV. FUTURE APPLICATIONS

Civilian and military witnesses were united in expressing interest and optimism for the future uses to which vehicles employing the ground-cushion phenomenon may be put. Certain of the applications appear to be nearer at hand than others. It is obvious that more time and very probably a considerable amount of money will have to be devoted to research and development before some of the possible applications can be fully realized.

The following excerpts, taken from the public statements and testimony of witnesses appearing before the Committee on Science and Astronautics, are representative of current opinion of persons most involved in this field.

Mr. J. B. Macauley

A number of factors have influenced the increase in interest of scientists and engineers in learning more about the ground cushion and its effect on air vehicles, particularly military aircraft.

First, the technological competition between the East and the West has demanded the investigation of any natural phenomena that might improve our military or economic systems.

Second, the increasing realization of the capability of an enemy to use nuclear weapons in any kind of conflict will require dispersal of installations and inhibit concentration of troops; consequently, our Armed Forces must have much greater degree of mobility than ever before.

Third, the possibility that free world forces will have to fight in less developed areas where inadequate transportation systems exist. This factor again indicates the need for increasing the mobility of military forces and reducing their dependence on such prepared facilities as roads, railroads, airfields, and port facilities. * * *

Sporadic investigations have been made during this decade by scientists and engineers for advantageously applying the ground cushion to hardware—all of these were conducted by the trial and error method. The Department of Defense, recognizing the military potential of ground-effect machines, is now coordinating the research and development activities of the services to provide an understanding of the ground-cushion phenomenon. In this manner, the Department of Defense can arrive at timely decisions to proceed with prototype developments that will result in significant increases in the combat effectiveness of the Armed Forces.

Brig. Gen. Frank H. Britton

Military success depends upon firepower, communications, and mobility. You are thoroughly familiar with the tremendous advances that have been made in firepower available to military forces since World War II. Similarly, communications have been vitally improved. For our Army to exploit these advances both offensively and defensively, mobility must keep pace, but improvements have lagged behind the achievements in the two other fields. The American Army has made and is making definite advances in ground mobility, but something more is required for the future—particularly in limited war. We hope to provide much of the mobility required in the future by the integration of air vehicles into combat and combat support units. Originally, Army aviation was used principally for observation, command, and liaison-type missions. Since World War II its capabilities have been exploited and expanded for additional missions such as the movement of troops in the combat zone, the movement of critical supplies, and battlefield casualty evacuation. We are now moving toward the use of aerial vehicles as actual replacements for ground vehicles in certain combat units. First to be considered are those units fulfilling the traditional cavalry roles of reconnaissance, screening, pursuit, and other such tasks requiring "hypermobility" in comparison with the rest of the Army.

For centuries the armies of the world have used woods, hills, and other terrain features to provide cover and concealment. On the other hand, these very same features have seriously limited these armies in their mobility and maneuverability. With air vehicles designed for our purpose, we expect to develop certain air-mobile units which will continue to make use of terrain features for cover and concealment, yet free these same units from obstacles of terrain. * * *

I make reference to the joint Army-Air Force-sponsored program to develop a VTOL research vehicle with AVRO Aircraft, Ltd., of Canada, which makes use of the ground-cushion phenomenon. This research vehicle, known as the Avrocar, appears to offer a great potential to the U.S. Army for increasing its mobility in the combat area.

Rear Adm. Rawson Bennett

Preliminary results of initial research efforts have indicated that the ground proximity machine will be able to operate with equal facility over land and water. Therefore, one of the more obvious uses for such a machine is as an amphibious transport or as an assault boat. A boat-type bow and watertight structure with low silhouette and moderate load-lifting capability are design criteria dictated by this mission. Vehicles comparable in size and payload to present amphibious assault craft would be extremely valuable in accelerating the ship-to-shore movement. Traveling 4 or 5 feet over the wave tops at speeds up to 50 miles per hour and capable of negotiating beaches up to 15-percent slope, the vehicle would present a far less vulnerable target than our present craft and would open the world's tideland and river delta areas as avenues of approach for assault or for peaceful cargo moving.

An application to antisubmarine warfare is visualized using searching and homing devices mounted on a radio-controlled platform. This hunter-killer platform would have to operate at heights only great enough to clear the waves and at speeds only 20 percent higher than the latest atomic submarine. Structurally, the platform should be capable of floating in heavy seas for extended times—then lifting and tracking automatically. Because of its inherent weight-lifting ability, the machine becomes an ideal killer—able to place a bomb or charge directly on the enemy submarine by radio command from the mother ship and then scoot away to safety. * * *

Circular ship platforms 1,000 feet in diameter, capable of speeds up to 150 knots, have been outlined in foreign newspapers and periodicals. Because of their huge size, these machines might operate up to 50 feet above the waves, thus permitting maximum weight-lifting potential and stability.

These are by no means the only ones possible. Our investigators are studying these and many others, and it is certainly possible that some use not even contemplated at this time may be the most worthwhile adaptation of the ground proximity principle. * * *

Since our first investigative efforts, the Navy has exhibited leadership and maintained an overall cognizance of the work being done. It is our intention to continue to "look forward" through an objective program which will accomplish the required phases of research and exploratory development leading to the acquisition of an optimum vehicle.

Dr. Andrew A. Kucher

We look upon the Levacar as a new form of high-speed land transportation, probably in the field of rail surface travel, for fast trips of distances of up to about 1,000 miles. Levapads already have been designed to fit around a rail, not only raising the vehicle from it but also holding it away from the rail sides. The overhead monorail principle is ideally suited to the Levacar. * * *

Gliding on a film of air offers great advantages over flying some distance off the ground in the conventional manner. About 60 percent of a plane's drag is in the wings and empennage. Eliminating these, as we have done in the Levacar, gives considerably greater propulsion efficiency. I foresee that a 250-mile trip in a Levacar, about the distance from Washington to New York, would require less than 1 hour. * * *

We are also analyzing the other systems of air levitation, those which provide a vertical ascension in the same sense as previously described by Mr. Macauley. Our studies again relate to flyable vehicles rather than winged cars. The concept of an automobile with wings has been propagated for years and years. This is untenable. The concept, however, of a flying automobile is not untenable, for the problems of increasing the available power-to-weight ratio and the further ability of instantaneous sensing of forces for corrective action are bordering upon accomplishment. Therefore, it seems to us the combination of those two funda-

mentals can be developed to provide a true "flying automobile." The near-ground movement of small vehicles is the first phase we are pursuing from the study standpoint.

Mr. Carl W. Bollum, Sr.

Among the many potential civilian uses for such vehicles, perhaps the most readily apparent is its use as a sport vehicle which could be used by fishermen, hunters, or merely as a vehicle to replace the outboard motor or speedboat. Commercially such vehicles could be used for transporting personnel and material to and from oil drilling rigs in the Gulf of Mexico, small islands off the coast, and the Texas Towers off Cape Cod. Vehicles could be built which would be able to transport fish from the fishing fleets very rapidly to the market areas and transport men and supplies out to the fleet, enabling the fleet to stay in the fishing area for longer periods of time. For future transportation it is very possible that within a period of 5 or 6 years we may have ferry systems operating from Florida to South America via the islands, carrying automobiles, passengers, and cargo at speeds up to 100 miles an hour. It is also very possible that within the next 10 years a transoceanic vehicle will be built approximately 300 feet in diameter, operating up to 30 feet over the top of the water, at speeds of 200 miles an hour.

Mr. William H. Alper

Forecasting the potentialities of free air suspension system, or peripheral-jet vehicles, depends on a full understanding of the concept and an uninhibited view of, the operating functions which it can perform. For combat vehicles it will provide extremely high mobility since it can operate over a wide variety of terrain and surface conditions. Using its wheels it can be driven in and out of buildings and along city streets and highways but, in addition, when there are no paved surfaces it can lift itself off the ground and traverse terrain surfaces such as water, ice, snow, mud, desert sands, and arctic tundra. Here we wish to reemphasize that this is a surface vehicle; a high mobility vehicle capable of traveling in close proximity to the ground and capable of clearing most obstructions found on the earth's surface.

Combat vehicles whose mobility characteristics would be greatly enhanced by the employment of the free air suspension system are considered to include combat reconnaissance and tactical vehicles such as light tanks.

Considering the high mobility capability of this type vehicle other applications to such uses as missile carriers, logistic carriers, assault craft and others come to mind.

V. CONCLUSIONS

The ground-cushion phenomenon is not newly discovered. It has been known and investigated over a period of more than 20 years, but in a desultory fashion. Recently, research effort has been stimulated considerably. Theories have been advanced to account for the phenomenon, and do so at least in part. The results obtained so far in unclassified work, while most encouraging, are largely experimental in nature. It remains to be determined whether present theories are completely valid when applied to the design of large size machines and vehicles.

Department of Defense interest centers primarily around: (1) *Vehicles which operate effectively either by ground-cushion effect or by aerodynamic lift;* and (2) *vehicles which operate by ground-cushion effect and which have limited conventional surface mobility.* In the case of the first, as exemplified by the Avrocar project, the rate of effort and funding seem to be adequate at this time for the accomplishment of development objectives. If full development objectives are met, full-scale application will require greatly augmented funding support.

In the case of vehicles operating wholly within the ground cushion, Government direction to produce a coordinated effort has been lacking. A number of small efforts, meagerly financed and deriving little or no benefit from the work of others, has been the rule. The Depart-

ment of Defense appears to have recognized this deficiency and is now proceeding on the basis of a more coordinated effort.

Several small civilian companies have also recognized the possibilities for utilization of vehicles operating wholly within the ground cushion, but have been limited by lack of personnel, research facilities and operating capital. Their efforts have been primarily in the experimental area and they have not been in a position to engage in extensive work on the development of theory. Even so, their efforts leading to the fabrication of demonstration models are commendable.

Of all the applications which can be freely discussed in this unclassified report, the air-bearing type of vehicle, such as has been proposed by the Ford Motor Co., appears closest to availability. Provided that the need can be shown to exist and funds are available, it appears possible to construct a high-speed monorail system with the knowledge now representing the current state-of-the-art.

The future can be bright indeed for this new means of transportation, for it enters the field at a time when our highways are clogged with truck and bus juggernauts and flooded with pleasure cars. The airways, with greatly expanding traffic, are daily becoming more dangerous. The railroads, while continuing to be efficient transporters of heavy freight, are too slow for our speeded-up tastes. Vehicles operating upon the ground-cushion effect may be an important answer to at least part of our civilian transportation problem.

Military uses range from combat and cargo vehicles operating a few feet above the surface to highly versatile reconnaissance or personnel-carrying vehicles capable of hovering a few feet above the surface or flying high and fast. The traditional foes of mobility—mud, swamp, sand, snow and Arctic tundra—need no longer prevent military operations and naval warfare may be revolutionized through use of high-speed above-water vessels.

The interest and optimism of both civilian and military leaders promise important progress in the near future.

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86TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
1st Session } { No. 522

CENTENNIAL OF AMERICAN DENTAL ASSOCIATION

JUNE 10, 1959.—Referred to the House Calendar and ordered to be printed

Mr. FORRESTER, from the Committee on the Judiciary, submitted the following

REPORT

[To accompany S. Con. Res. 7]

The Committee on the Judiciary, to whom was referred the resolution (S. Con. Res. 7) extending best wishes of Congress to the American Dental Association on the centennial of its founding, having considered the same, report favorably thereon with an amendment and recommend that the resolution as amended do pass.

The amendment is as follows:

Strike out all the whereas clauses except the last one.

GENERAL STATEMENT

On August 3, 1859, the American Dental Association was founded. This year it marks the 100th anniversary of that occasion. During that time, the American Dental Association has worked unceasingly to advance the science of dentistry so that the people of this country might have available to them the finest dental care in the world. In recognition of the contribution which has been made by the American Dental Association, this resolution would extend the best wishes of Congress to the association upon the occasion of its 100th anniversary.

59013°—59 H. Rept., 86-1, vol. 3——55

86TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
1st Session } { No. 523

PROVIDING FOR THE TRANSFER OF CASES BETWEEN DISTRICT COURTS AND THE COURT OF CLAIMS

JUNE 10, 1959.—Referred to the House Calendar and ordered to be printed

Mr. FORRESTER, from the Committee on the Judiciary, submitted the following

REPORT

[To accompany H.R. 5396]

The Committee on the Judiciary, to whom was referred the bill (H.R. 5396) to amend title 28 of the United States Code to provide for transfer of cases between the district courts and the Court of Claims, having considered the same, report favorably thereon without amendment and recommend that the bill do pass.

PURPOSE

The purpose of the bill is to authorize the transfer of cases between the district courts and the Court of Claims and vice versa in order to cure jurisdictional defects.

NEED OF LEGISLATION

Testimony before a subcommittee of the House Judiciary Committee, by lawyers engaged in maritime practice, revealed substantial difficulty for even the most diligent and experienced lawyers in choosing the proper forum for certain maritime claims against the Government. This bill would prevent otherwise meritorious claims from being time-barred as a result of such unavoidably inappropriate choices of forum.

COST

No additional cost to the Government is involved.

JUDICIAL AND DEPARTMENTAL RECOMMENDATION

A bill identical to H.R. 5396 was introduced in the 85th Congress and passed the House late in the 2d session. Reports were requested of interested departments and agencies in 1958. There is no reason to

believe that there has been any change in the views which were transmitted to the committee at that time. The Judicial Conference of the United States recommended approval of this bill. In addition, the chief judge of the Court of Claims, on behalf of that court, strongly endorsed it. Reports were requested from both the Department of the Navy and the Department of Justice. Navy reported that the problems were primarily under the jurisdiction of Justice and Justice did not report. The recommendations which were received are appended hereto.

GENERAL STATEMENT

Contract suits against the United States involving certain maritime transactions may be brought either in the Court of Claims or in the U.S. district courts in admiralty depending upon the statutory authority involved. Thus, suits under the Suits in Admiralty Act (41 Stat. 526, 46 U.S.C. 741) and the Public Vessels Act (43 Stat. 112, 46 U.S.C. 781) lie exclusively in admiralty in the U.S. district courts, while under the Tucker Act (28 U.S.C. 1346) there is concurrent jurisdiction in the district courts and the Court of Claims for claims not exceeding $10,000 and exclusive jurisdiction in the Court of Claims for claims in excess of $10,000. In addition to jurisdictional differences under these statutes, there are also differences in the applicable statutes of limitations. Under the Tucker Act the statute of limitations is 6 years, while under the Suits in Admiralty Act and the Public Vessels Act it is 2 years.

Since the applicability of these acts to a given factual situation is frequently exceedingly difficult to determine and a question on which reasonable men may differ, lawyers in maritime practice occassionally and unavoidably bring suit in the wrong forum. This presents no problem in claims under $10,000 brought in the district courts. If improperly brought in admiralty, the case may be transferred to the law side of the court (*The Everett Fowler*, 151 F. 2d 662 (2d Cir. 1945), certiorari denied, 327 U.S. 804 (1945)). It would seem that the converse would also be held proper where a case filed on the law side is held to be properly under the Suits in Admiralty Act.

The serious problem, and the one to which this bill is directed, arises in claims exceeding $10,000 where there is uncertainty as to whether a suit is properly brought under the Tucker Act on the one hand or the Suits in Admiralty or Public Vessels Act on the other. Since, under existing law, cases are not transferrable between the district courts and the Court of Claims, an inappropriate choice of jurisdiction may result in the statute of limitations having run against a claim by the time the issue of appropriate jurisdiction is finally adjudicated.

A substantial portion of the jurisdictional uncertainty in this area is attributable to confusion in establishing whether a vessel is a "merchant vessel" or a "public vessel." If a "merchant vessel," under the Suits in Admiralty Act exclusive jurisdiction is in the district courts in admiralty. If a "public vessel," jurisdiction may be either in admiralty under the Public Vessels Act or under the Tucker Act, depending on the nature of the claim. It will be recalled that a claim under the Tucker Act exceeding $10,000 must be brought in the Court of Claims.

Some indication of the difficulties confronting maritime lawyers in choosing a proper forum where the merchant vessel-public vessel issue arises can be seen from the following cases:

(1) In *Calmar Steamship Corp.* v. *U.S.* (103 F. Supp. 243 (1951)) the district court held that a suit involving a privately owned vessel which was operated for the United States and carrying military supplies was properly in admiralty because the ship was a merchant vessel within the meaning of the Suits in Admiralty Act. The court of appeals reversed on the ground that the ship was not a merchant vessel, since it was carrying war materiel (197 F. 2d 795 (1952)). On appeal to the Supreme Court, it was held that the ship was a merchant vessel and the court of appeals was reversed (345 U.S. 446 (1953)).

(2) In *Aliotti* v. *U.S.* (221 F. 2d 598 (1955)) the Court of Appeals for the Ninth Circuit held that a suit by the owner of a vessel, bareboat-chartered to the United States, to recover the cost of restoration to its original condition, came exclusively under the Public Vessels Act, whether or not the vessel was a merchant vessel or a public vessel. In direct conflict was the decision of the first circuit in *Eastern Steamship Lines* v. *U.S.* (187 F. 2d 957 (1951)) which held that a similar suit involving a public vessel came exclusively within the Tucker Act and not the Public Vessels Act.

Conflicting decisions as to jurisdiction also have been rendered in general average claim suits against the United States. The Court of Claims, in *Lykes Bros. Steamship Co., Inc.* v. *U.S.* (124 F. Supp. 622 (1954)) held that such suits lay in admiralty. On the other hand, the District Court for the Southern District of New York held that jurisdiction lay at law under the Tucker Act (*States Marine Corp. of Delaware* v. *U.S.*, 120 F. Supp. 585 (1954)). However, the Court of Appeals for the Second Circuit reversed and held that admiralty was the proper forum.

Uncertainties of this kind have arisen in charter accounting suits for the recovery of alleged overpayments to the U.S. Maritime Commission. In *Smith-Johnson Steamship Corp.* v. *U.S.* (139 F. Supp. 298 (1956)) the Court of Claims held that it had jurisdiction. In a similar suit the Court of Appeals for the Second Circuit held that jurisdiction lay exclusively in admiralty (*Sword Line, Inc.* v. *U.S.* 228 F. 2d 344 (1955), 230 F. 2d 75 (1956)). Upon affirmance of the second circuit decision by the Supreme Court at 351 U.S. 976 (1956), the Court of Claims reversed its earlier holding and dismissed a large number of suits which had been filed in that court.

The possibility of counsel unavoidably choosing the inappropriate forum is thus apparent. In order to prevent dismissal of suits which would become time barred when the appropriate forum had finally been determined, this bill would permit the transfer of cases to the appropriate court. Since under transfer procedure the statute of limitations is tolled with the filing of the original suit, an action would not be dismissed because a subsequent decision that the plaintiff had chosen the wrong forum came at a time when the statute of limitations precluded filing a new action in the appropriate court. In dealing with the analogous problem of erroneously chosen venue, section 1406 (a) of title 28 authorizes a district court, where it is in the interest of justice, to transfer rather than dismiss a suit brought with improper venue.

The reform of existing practice embodied in this bill is another expression of the underlying philosophy of the Federal Rules of Civil Procedure and of modern legal practice generally, that the decisive question in a lawsuit should, as far as possible, be its merits and not esoteric, technical problems of procedure.

U.S. COURT OF CLAIMS,
Washington, D.C., April 30, 1958.

Hon. EMANUEL CELLER,
Chairman, Committee on the Judiciary,
House of Representatives, Washington, D.C.

DEAR MR. CHAIRMAN: In answer to your inquiry of April 26, in reference to H.R. 3046 now pending before your committee, we are heartily in favor of the purposes of this legislation.

I may add that this type of legislation is especially needed in those cases in which the question of which court has jurisdiction is a close one. In such cases it is rather difficult for the attorney representing the plaintiff to determine in which court suit should be brought. It will be a matter of economy to litigants on both sides to have the case transferred and thus save the expense of dismissal and refiling in the other court.

Then, too, it sometimes develops that when the matter of jurisdiction is finally determined in a pending case it is too late to file in the other court and thus a disposition on the merits is not had. This is perhaps one of the major reasons for the enactment of the proposed legislation.

The need of the legislation seems so clear that unless you wish us to do so we will not have a representative present. However, if you or the committee wish us to do so I shall be happy to come personally or to send one of our trial commissioners, W. Ney Evans, who is thoroughly familiar with the subject.

If you deem it desirable that a representative of our court should be present will you kindly have the office force notify us; otherwise we will treat this letter as stating the views of our court in the matter.

Thanking you for your thoughtfulness in affording us this opportunity, I am,

Sincerely yours,

MARVIN JONES, *Chief Judge.*

ADMINISTRATIVE OFFICE OF THE UNITED STATES COURTS,
Washington, D.C., March 7, 1958.

Hon. EMANUEL CELLER,
Chairman, Committee on the Judiciary,
House of Representatives, Washington, D.C.

DEAR MR. CHAIRMAN: The Judicial Conference of the United States, at its session in September 1957, considered the proposal contained in H.R. 3046, now pending before your committee, to amend title 28 of the United States Code to provide for transfer of cases between the district courts and the Court of Claims.

This proposal was first brought to the attention of the Judicial Conference at its September 1954 session and at that time the Con-

ference approved H.R. 9346 of the 83d Congress, which is identical to H.R. 3046, 85th Congress. At its session in March 1955, the Conference also approved H.R. 668, of the 84th Congress containing the same proposal.

I am authorized to inform you that the Judicial Conference of the United States at its most recent session renewed its recommendation for this proposed legislation and approved the enactment of H.R. 3046.

Sincerely yours,

WARREN OLNEY III, *Director.*

DEPARTMENT OF THE NAVY,
OFFICE OF THE SECRETARY,
Washington, D.C., May 1, 1958.

Hon. EMANUEL CELLER,
Chairman, Committee on the Judiciary,
House of Representatives, Washington, D.C.

MY DEAR MR. CHAIRMAN: Your request for comment on H.R. 3046, a bill to amend title 28 of the United States Code to provide for transfer of cases between the district courts and the Court of Claims, has been referred to this Department by the Secretary of Defense for the preparation of a report thereon expressing the views of the Department of Defense.

The purpose of the bill is to amend title 28 of the United States Code to provide that if a case within the exclusive jurisdiction of the Court of Claims is filed in the district court, the district court shall transfer such case to the Court of Claims, unless the parties consent to a dismissal of the case. It further provides that the Court of Claims shall transfer any case filed in the Court of Claims but within the exclusive jurisdiction of the district courts to any district court in which it could have been brought at the time such case was filed, unless the parties thereto consent to a dismissal of the case.

H.R. 3046 deals with problems that are primarily under the jurisdiction of the Attorney General of the United States. Therefore, the Department of the Navy, on behalf of the Department of Defense, defers to the views of the Department of Justice with respect to enactment of H.R. 3046.

This report has been coordinated within the Department of Defense in accordance with procedures prescribed by the Secretary of Defense.

The Department of the Navy has been advised by the Bureau of the Budget that there is no objection to the submission of this report on H.R. 3046 to the Congress.

Sincerely yours,

R. Y. MCELROY,
Captain, U.S. Navy,
Deputy Director, Legislative Liaison
(For the Secretary of the Navy).

CHANGES IN EXISTING LAW

In compliance with clause 3 of rule XIII of the House of Representatives, there is printed below in roman existing law in which no change is proposed, with matter proposed to be stricken out inclosed in black brackets and new matter proposed to be added shown in italics:

TITLE 28, UNITED STATES CODE

§ 1406. CURE OR WAIVER OF DEFECTS.

(a) * * *
(b) * * *
(c) If a case within the exclusive jurisdiction of the Court of Claims is filed in a district court, the district court shall, unless the parties consent to dismissal, transfer such case to the Court of Claims.

TITLE 28, UNITED STATES CODE

CHAPTER 91.—COURT OF CLAIMS

1491. * * *
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1505. * * *
1506. Transfer to cure defect of jurisdiction.

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§ 1506. TRANSFER TO CURE DEFECT OF JURISDICTION.

If a case within the exclusive jurisdiction of the district courts is filed in the Court of Claims, the Court of Claims shall, unless the parties consent to dismissal, transfer such case to any district court in which it could have been brought at the time such case was filed.

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86TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
1st Session } { No. 524

HUDSON-CHAMPLAIN CELEBRATIONS

JUNE 10, 1959.—Referred to the House Calendar and ordered to be printed

Mr. FORRESTER, from the Committee on the Judiciary, submitted the following

REPORT

[To accompany H.J. Res. 266]

The Committee on the Judiciary, to whom was referred the joint resolution (H.J. Res. 266), requesting the President to issue a proclamation designating 1959 for the observance of the 350th anniversary of the historic voyages of Hudson and Champlain, having considered the same, report favorably thereon without amendment and recommend that the joint resolution do pass.

GENERAL STATEMENT

In 1958, Congress passed and the President signed a bill establishing the Hudson-Champlain Celebration Commission. The task of that Commission was to develop and execute plans for the celebration, in 1959, of the 350th anniversary of the exploratory voyages of Henry Hudson and Samuel de Champlain. The commemorative functions contemplated in that legislation are now well underway. It is the purpose of this resolution to encourage participation and interest in these historic events. To that end, this bill requests the President to issue a proclamation designating 1959 as the year of the Hudson-Champlain celebrations.

O

TITLE 28, UNITED STATES CODE

§ 1406. CURE OR WAIVER OF DEFECTS.

(a) * * *
(b) * * *
(c) If a case within the exclusive jurisdiction of the Court of Claims is filed in a district court, the district court shall, unless the parties consent to dismissal, transfer such case to the Court of Claims.

TITLE 28, UNITED STATES CODE

CHAPTER 91.—COURT OF CLAIMS

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1506. Transfer to cure defect of jurisdiction.

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§ 1506. TRANSFER TO CURE DEFECT OF JURISDICTION.

If a case within the exclusive jurisdiction of the district courts is filed in the Court of Claims, the Court of Claims shall, unless the parties consent to dismissal, transfer such case to any district court in which it could have been brought at the time such case was filed.

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86TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
1st Session } { No. 524

HUDSON-CHAMPLAIN CELEBRATIONS

JUNE 10, 1959.—Referred to the House Calendar and ordered to be printed

Mr. FORRESTER, from the Committee on the Judiciary, submitted the following

REPORT

[To accompany H.J. Res. 266]

The Committee on the Judiciary, to whom was referred the joint resolution (H.J. Res. 266), requesting the President to issue a proclamation designating 1959 for the observance of the 350th anniversary of the historic voyages of Hudson and Champlain, having considered the same, report favorably thereon without amendment and recommend that the joint resolution do pass.

GENERAL STATEMENT

In 1958, Congress passed and the President signed a bill establishing the Hudson-Champlain Celebration Commission. The task of that Commission was to develop and execute plans for the celebration, in 1959, of the 350th anniversary of the exploratory voyages of Henry Hudson and Samuel de Champlain. The commemorative functions contemplated in that legislation are now well underway. It is the purpose of this resolution to encourage participation and interest in these historic events. To that end, this bill requests the President to issue a proclamation designating 1959 as the year of the Hudson-Champlain celebrations.

86TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
1st Session } { No. 526

CONSIDERATION OF H.R. 7500

JUNE 10, 1959.—Referred to the House Calendar and ordered to be printed

Mr. O'NEILL, from the Committee on Rules, submitted the following

REPORT

[To accompany H. Res. 293]

The Committee on Rules, having had under consideration House Resolution 293, reports the same to the House with the recommendation that the resolution do pass.

86TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
1st Session } { No. 527

CONSIDERATION OF H.R. 5752

JUNE 10, 1959.—Referred to the House Calendar and ordered to be printed

Mr. MADDEN, from the Committee on Rules, submitted the following

REPORT

[To accompany H. Res. 294]

The Committee on Rules, having had under consideration House Resolution 294, report the same to the House with the recommendation that the resolution do pass.

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81st Congress
1st Session
} HOUSE OF REPRESENTATIVES { Report
No. 827

CONSIDERATION OF H.R. 5762

June 10, 1950.—Referred to the House Calendar and ordered to be printed

Mr. Madden, from the Committee on Rules, submitted the following

REPORT

[To accompany H. Res. 702]

The Committee on Rules, having had under consideration House Resolution 702, report the same to the House with the recommendation that the resolution do pass.

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86TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
1st Session } { No. 528

DESIGNATING PETALUMA CREEK IN CALIFORNIA AS THE PETALUMA RIVER

JUNE 10, 1959.—Referred to the House Calendar and ordered to be printed

Mr. BLATNIK, from the Committee on Public Works, submitted the following

REPORT

[To accompany H.R. 2191]

The Committee on Public Works, to whom was referred the bill (H.R. 2191) to designate a stream in California as the "Petaluma River," having considered the same, report favorably thereon without amendment and recommend that the bill do pass.

PURPOSE OF THE BILL

The purpose of the bill is to designate a waterway in California now known as Petaluma Creek as the "Petaluma River." Because of its size and commercial importance, local interests feel that "river" is a more appropriate and descriptive name for this waterway than "creek."

GENERAL STATEMENT

Petaluma Creek rises in Sonoma County and flows into the northwest side of San Pablo Bay—an arm of San Francisco Bay—about 20 miles north and east of the Golden Gate. Improvement of Petaluma Creek by the Corps of Engineers was first authorized in 1880. The total length of improved channels is now about 19 miles. The authorized project provides a channel 8 feet deep and 200 feet wide at the mouth, narrowing to 100 feet wide upstream to the city of Petaluma.

Waterborne commerce averaged 246,000 tons a year during the period 1946–55, inclusive. In 1955 it carried 302,358 tons; in 1956, 169,490 tons, and in 1957, 268,261 tons.

The committee is advised that the bill has the support of interested groups and individuals in the city of Petaluma, including the city council and Petaluma Chamber of Commerce. In view of the fact that the stream in question is relatively large and carries a considerable amount of commerce, the committee can see no objection to the

change in designation of this waterway and recommends enactment of H.R. 2191 in accordance with the desires of local interests.

The bill was referred to the Department of the Army and the Department of the Interior, as well as the Board on Geographic Names, and the committee was advised by these agencies that they would have no objection to favorable action on the measure.

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86TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
1st Session } { No. 529

AUTHORIZING APPROPRIATIONS FOR THE ATOMIC ENERGY COMMISSION

JUNE 10, 1959.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

Mr. DURHAM, from the Joint Committee on Atomic Energy, submitted the following

REPORT

[To accompany H.R. 7537]

The Joint Committee on Atomic Energy, having considered H.R. 7537, an original committee bill to authorize appropriations for the Atomic Energy Commission, in accordance with section 261 of the Atomic Energy Act of 1954, as amended, report favorably thereon with amendments, and recommend that the bill, as amended, do pass.

The amendments to the bill adopted by the Joint Committee are as follows:

1. On page 4, line 9, strike out the word "Test" and insert in lieu thereof the word "Testing."

2. On page 12, line 19, after the period, insert the following:

> There are also authorized to be appropriated such additional funds as may be necessary for the operation of such reactor prototypes, as provided in subsection 111(a)(1) of Public Law 85–162.

3. On page 13, line 20, strike out the word "proposed" and insert in lieu thereof the word "proposal".

4. On page 14, line 3, strike out the word "other".

EXPLANATION OF COMMITTEE AMENDMENTS

The first amendment adopted by the Joint Committee amends the name of the site for project 60–e–11 from "National Reactor Test Station, Idaho," to the correct name of "National Reactor Testing Station, Idaho," as set forth in other projects in section 101 (60–e–1, 60–e–2, 60–e–2, 60–e–3, 60–e–5, and 60–e–7).

The second amendment adopted by the Joint Committee amends subsection 110(d) of the bill to authorize funds for the operation of reactor prototypes in the second round of the AEC power demonstration reactor program. Such reactors will be owned by the Commission, but operated by cooperatives or municipal agencies, and the Atomic Energy Commission has requested this amendment in order that authorization may be provided for funds required for their operation. The information obtained through the operation of these reactors will be of value in the demonstration program, and the Joint Committee therefore approved this amendment to the bill.

The third amendment above is a technical amendment, and amends the word "proposed" on page 13, line 22 to "proposal," in order to correct a typographical error.

The fourth amendment strikes the word "other" in clause (b) of subsection 110(f) on page 14, line 4, for the reason that it is unnecessary and might cause doubt as to the meaning of clause (a) of that subsection.

All the above four amendments were either requested by, or acceptable to, the Atomic Energy Commission.

Summary of Bill

The bill authorizes appropriations for the Atomic Energy Commission in accordance with section 261 of the Atomic Energy Act of 1954, as amended.

Section 101 of the bill authorizes $165,400,000 for AEC new construction projects. The format of this section is similar to section 101 of previous AEC authorization acts and lists a total of 43 projects under the following subparagraphs: "Special Nuclear Materials" (a and b); "Atomic Weapons" (c and d); "Reactor Development" (e and f); "Physical Research" (g); "Biology and Medicine" (h); "Isotopes Development" (i and j); "Community" (k); and "General Plant Projects" (l).

The Joint Committee has included in the bill all projects requested by the Commission. In addition it has recommended an increase in the amount of one project (biology and medicine, project 60–h–1), and has added three projects under "Reactor Development" and two projects under "Physical Research" which the Joint Committee considers important for the atomic energy program, as explained in more detail further in this report.

Sections 102 through 106 of the bill contain provisions identical or similar to corresponding sections in previous AEC authorization acts. They pertain to "Limitations" (sec. 102), "Advance Planning and Design" (sec. 103), "Restoration or Replacement" (sec. 104), "Currently Available Funds" (sec. 105) and "Substitutions" (sec. 106).

Section 107 of the bill amends prior projects authorized by Public Law 85–590 last year by decreasing project 59–d–10 from $51 million to $30 million, by increasing project 59–e–11 from $1 million to $10 million, and by increasing project 59–d–12 from $2,500,000 to $4,500,000.

Section 108 amends two prior AEC authorization acts by rescinding authorization for certain projects no longer considered necessary by the AEC and the Joint Committee.

Section 109 authorizes to be appropriated the sum of $7 million, in addition to $3 million previously authorized, for the Euratom research and development program. Section 3 of Public Law 85–846, the Euratom Cooperation Act of 1958, provides that amounts made available to the program by the United States must be matched by equivalent amounts made available by the Euratom countries for use in the joint research and development program.

Section 110 of the bill pertains to the cooperative power reactor demonstration program. It reduces by $20 million the amount authorized by Public Law 85–590, last year's AEC authorization act. It then authorizes new funds of $55,500,000, and an additional $10 million waiver of use charge authorization, for use in the cooperative power reactor demonstration program. The types of reactors to be considered by the Commission, the methods of assistance authorized, and the other terms and conditions set forth in section 110 are explained more fully further in this report.

Section 111 of the bill authorizes the Commission to enter into cooperative arrangements with respect to the experimental low temperature process heat reactor authorized under project 60–e–14 of subsection 101(e) of the bill.

Section 112 provides that in the event the Commission constructs a power reactor under the authorization of project 60–e–15, or under subsection 110(e) of the bill, at AEC installations, certain provisions shall apply, corresponding to similar provisions in prior AEC authorization acts.

Section 113 provides that the Commission shall proceed with certain design and engineering studies considered important by the Joint Committee and submit reports to the Joint Committee by April 1, 1960.

Section 114 of the bill amends subsection 153(h) of the Atomic Energy Act of 1954 by providing that the provisions of section 153 shall apply to any patent the application for which shall have been filed before September 1, 1964, rather than September 1, 1959. Section 153 of the Atomic Energy Act pertains to compulsory licensing of atomic energy patents. The Commission recommended extension of the provisions of section 153 for an additional 5 years, and the Joint Committee concurs. Further amendments to the patent provisions of the Atomic Energy Act are still under consideration by the Joint Committee, as explained in the section-by-section analysis portion of this report.

Further details concerning the various sections in this bill are contained in the section-by-section analysis and other portions of this report.

Background

By letter dated February 17, 1959, the Chairman of the Atomic Energy Commission forwarded to the President of the Senate and Speaker of the House of Representatives a proposed bill to authorize appropriations for the Atomic Energy Commission for the fiscal year 1960 program. The letters and proposed bills were forwarded to the Joint Committee on Atomic Energy. On February 26, 1959, Senator Anderson introduced (by request) the proposed bill as S. 1194. On March 2, 1959, Congressman Durham introduced (by request) the proposed bill as H.R. 5106.

On February 27, 1959, the Subcommittee on Legislation of the Joint Committee undertook extensive hearings, on the bills, continued in March, April, and May, as summarized in the next section of this report.

After completion of the hearings the Subcommittee on Legislation met to consider the bills, S. 1194 and H.R. 5106, and possible amendments and revisions on April 20 and 21, May 4, 8, 9, and 12, 1959. On May 12, 1959, the subcommittee voted to forward to the full committee the bills with certain suggested revisions, and the recommendations of the subcommittee were incorporated into a committee print dated May 15, 1959, copies of which were forwarded to the Atomic Energy Commission and comments requested.

Thereafter the Commission made certain comments during staff meetings and by letters to the Joint Committee. The full committee met on May 28 and June 2, 1959, to consider the committee print recommended by the subcommittee, and further revisions and amendments suggested by committee members, or requested by the Atomic Energy Commission. On June 2, 1959, the committee voted to file clean bills representing the conclusions of a majority of the committee members in all respects.

On June 2, 1959, Senator Anderson, the chairman of the Joint Committee, filed the clean bill as S. 2094. On June 3, 1959, Congressman Durham, the vice chairman, filed an identical bill as H.R. 7537. Both bills were referred to the Joint Committee on Atomic Energy.

On June 10, 1959, the Joint Committee met and voted to report out the bills with certain minor amendments explained heretofore in this report.

Hearings

On February 27, 1959, the day after the AEC draft bill had been introduced (by request) by Chairman Anderson, the Subcommittee on Legislation, under the chairmanship of Congressman Chet Holifield, commenced hearings on the bill. These hearings considered at great length every project and provision in the bill requested by AEC, and also certain other projects and matters which the subcommittee or its members considered important, as summarized in this section of the report.

On February 27, 1959, the subcommittee received testimony in the morning in executive session on the military and classified projects in the bill. Testimony was received from AEC representatives including the following: John A. McCone, Chairman; A. R. Luedecke, General Manager; Brig. Gen. A. D. Starbird, Director, Division of Military Applications; E. J. Bloch, Director, Division of Production; Don. S. Burrows, Controller.

The hearings were continued in public in the afternoon on unclassified projects in the bill. In addition to Chairman McCone and Commissioners Libby, Vance, Floberg, and Graham, the following AEC staff personnel were present: A. R. Luedecke, General Manager; Dr. Frank K. Pittman, Director, Division of Reactor Development; Dr. John H. Williams, Director, Division of Research; Dr. Paul Aebersold, Director, Office of Isotopes Development; Dr. Charles L. Dunham, Director, Division of Biology and Medicine; Algie A. Wells, Director, Division of International Affairs; Harold L. Price, Director,

Division of Licensing and Regulation; Don S. Burrows, Controller; Loren K. Olson, General Counsel.

On March 23, 1959, the Subcommittee on Legislation heard from Vice Adm. Hyman G. Rickover, Assistant Director for Naval Reactors, Division of Reactor Development, AEC, concerning the proposed natural circulation test plant, the proposed alterations to the Shippingport reactor, and other matters. In addition testimony was continued on the classified projects in the bill by the following AEC representatives: John F. Floberg, Commissioner; A. R. Luedecke, General Manager; Brig. Gen. A. D. Starbird, Director, Division of Military Applications; Dr. Frank K. Pittman, Director, Division of Reactor Development; U. M. Staebler, Senior Assistant Director, Division of Reactor Development; Maj. Gen. Donald A. Keirn, Assistant Director for Aircraft Reactors, Division of Reactor Development; Dr. John H. Williams, Director, Division of Research; Don S. Burrows, Controller; Col. Donald G. Williams, Assistant Director for Army Reactors; John A. Derry, Director, Division of Construction and Supply.

By March 24, 1959, the subcommittee had completed testimony on all projects in section 101 of the bill, and continued its hearings, in both the morning and afternoon, on sections 107 through 110 of the bill relating to amendments of prior year projects, recissions, Euratom, and the cooperative atomic power program. Testimony was received from the following representatives of the AEC: John A. McCone, Chairman; John F. Floberg, Commissioner; A. R. Luedecke, General Manager; Dr. Frank K. Pittman, Director, Division of Reactor Development; U. M. Staebler, Senior Assistant Director, Division of Reactor Development; Dr. John H. Williams, Director, Division of Research; and Mr. Loren K. Olson, General Counsel.

On March 25, 1959, the subcommittee conducted hearings in executive session to receive testimony from representatives of reactor manufacturers concerning proposed reactor projects. The following persons testified: D. F. Shaw and P. D. Bush, of Kaiser Engineers; William Banks, of ACF; Dr. Chauncey Starr, of North American Aviation; John R. Menke and Walter A. Hamilton, of Nuclear Development Associates; Ray Maxson, of Sargent & Lundy; and Mr. Hood Worthington, E. I. du Pont de Nemours & Co.

On April 13, 1959, in the morning, the subcommittee held a hearing in executive session on an analysis of reports on the U.S.S.R. atomic power program. On April 13, 1959, in the afternoon, the subcommittee held a hearing in executive session to receive a report on the work done under project 59–d–14, design and engineering study of a power reactor of advanced design capable of utilizing nuclear superheat. The following persons testified: S. L. Descartes, executive director, Puerto Rico Water Resources Authority; Dr. W. H. Zinn, president, General Nuclear Engineering Co.; Dr. John West, General Nuclear Engineering Co.; and U. M. Staebler, Senior Assistant Director, Division of Reactor Development, AEC.

On April 14, 1959, the subcommittee held hearings in public to receive testimony from representatives of the Atomic Energy Commission and certain contractors concerning design and engineering studies authorized by Public Law 85–590. Testimony was received from representatives of the Atomic Energy Commission, and representatives of contractors as follows: Dr. W. H. Zinn, president,

General Nuclear Engineering Co. (Combustion Engineering Co.); Mr. F. W. McCloska, Sargent & Lundy; John R. Menke, president, Nuclear Development Associates; Sidney Siegel, technical director, Atomics International.

On April 15, 1959, the subcommittee continued hearings on the design and engineering studies and additional testimony was received from AEC Chairman McCone and the following representatives of AEC contractors: W. H. Colquhoun, vice president, Ebasco Services, Inc.; Richard L. Schmidt, General Electric Co.; W. Kenneth Davis, Bechtel Corp.; and Sidney Siegel, Atomics International.

After the meetings of the subcommittee on April 20 and 21, and May 4, 1959, a draft bill was forwarded to AEC and comments requested.

On May 8, 1959, the subcommittee met to receive the AEC comments on the revised draft bill. AEC Chairman McCone, the other four Commissioners, the General Manager, and responsible AEC division directors were present and commented.

In addition to the above-summarized meetings of the Subcommittee on Legislation, the full committee held hearings in executive session on February 7, 1959, on the General Dynamics-Philadelphia Electric proposal (later authorized under sec. 110(f) of the bill), and on May 26, 1959, on Euratom developments (sec. 109). The following persons testified in the February 7 hearings: Frank Pace, Jr., Dr. Frederic de Hoffman, and Mr. Peter Fortescue, of the General Dynamics Corp.; George Rincliffe, of Philadelphia Electric Co.; James Landis, of Bechtel Corp.; Robert Ginna, of High Temperature Reactor Developments Associates, Inc.

The following persons testified during the May 26 hearing on Euratom: AEC Chairman McCone, Commissioner Floberg, and Dr. Amasa Bishop, AEC technical representative on Euratom.

Comments by the Joint Committee

1. CIVILIAN ATOMIC POWER PROGRAM

A. BACKGROUND

The Joint Committee on Atomic Energy has been concerned for a long time with the pace of the development and construction of prototype and large-scale reactors to test and demonstrate the practical problems of achieving economic nuclear power. (The history of the Joint Committee's concern, and the progress and problems as of July 1, 1958, are summarized in the Joint Committee's report on the AEC authorization bill for fiscal 1959, H. Rept. 2108, S. Rept. 1793, 85th Cong., at p. 9).

Since July 1958 several studies and reports on the atomic power program have been issued: The Edison Electric Institute final report of July 1958; the Joint Committee staff report of August 1958, and industry comments in the staff report dated December 1958; and the report of the AEC Ad Hoc Committee, dated January 1959. In February-April 1959 the Atomic Energy Commission submitted its atomic power program for fiscal 1960 together with its proposed policies for longer range application.

As a result of these studies and statements, it is clear that there is general agreement as to the objectives of the program, namely to

achieve economic atomic power in some areas of the United States within 10 years or less and abroad in 5 years.

Some progress has been achieved in reaching agreement as to the methods of carrying on the program. Thus for example the Commission has endorsed the policy added by the Joint Committee section 111(f) of the AEC authorization bill for fiscal 1959, which provides that AEC make public announcement, designating reactor types and specifying schedule of proposals under the demonstration program. Flexibility for assistance on unsolicited proposals under the third round has been provided in section 110(c) of the current bill as reported. The Commission is also proceeding with the design and construction of the so-called Kaiser-ACF gas-cooled flexible experimental prototype at the AEC Oak Ridge installation, with the electric power to be absorbed in connection with operations at the installation.

Section 110(e) with which AEC concurs, authorizes AEC to proceed with design and construction of reactor prototypes at AEC installations on which no satisfactory proposals under the second and third rounds are received for prototypes of established technology.

Questions which remain unresolved include that of the pace and level of support of the program, and the nature and extent of financial support of private reactor prototypes in the demonstration program. The Joint Committee staff report and the AEC ad hoc committee recommended substantial increases of financial support, in the words of the AEC ad hoc committee:

> Since the development of nuclear power is in fact proving to be difficult and expensive, the Government has been faced with a hard choice. Either this country continues its leadership at the cost of heavy expenditure or it accepts the probability that there will be no significant nuclear-power industry in this country until the technology has been developed elsewhere and can be reintroduced here. This (ad hoc) committee knows of little support for the latter alternative.

Whether the level of support and number of prototypes recommended by AEC and added by the Joint Committee is sufficient remains to be seen. It is believed that the amounts provided will at least provide a satisfactory basis for going ahead in fiscal 1960.

As discussed below, considerable attention was given to various alternatives providing for a capital grant for private and public reactor prototypes. It is planned to study these alternatives further during the recess between sessions.

A further question which remains to be considered as the program continues is the proper means of financing development and construction of large-scale prototype and commercial atomic powerplants.

During the past year design studies were performed by the Commission on four reactor concepts in accordance with the requirements of projects 59–d–12 and 59–d–13 of Public Law 85–590. The four reactor concepts studied and reported upon were pressurized water, boiling water, organic and natural uranium heavy water reactors. Comparison of the cost data developed in the studies indicates a calculated range of energy costs between 8 and 11 mills per kilowatt-hour. According to the studies, based upon present technology, nuclear energy costs are approximately 1 to 2 mills per kilowatt-hour

greater than energy costs from conventional powerplants. The studies also indicate that installation of multiple units at a station may decrease the costs of nuclear power.

It is hoped that industry consideration and reaction to the AEC design studies authorized by the Joint Committee, and to the program implemented by AEC under this authorization legislation, will provide more definitive information for consideration of further improvements in the program during the next year.

In its presentation, AEC requested authorization of a boiling water prototype of high density in the 50,000 electrical kilowatt range; a small prototype in the 10,000 to 20,000 electrical kilowatt range suitable for a cooperative or public power organization; research and development assistance for the high temperature gas-cooled project, 26,000 electrical kilowatts, proposed by the Philadelphia Electric-General Dynamics group, and two smaller reactor experiments, namely the low temperature process heat reactor experiment, and the experimental organic reactor. AEC also requested not to exceed $5 million for unsolicited proposals for research assistance on power reactors.

The Joint Committee has authorized all of the AEC projects. In addition, in order to provide a somewhat more extensive and better rounded program, the Joint Committee has recommended the following projects discussed below.

B. LINE ITEM PROJECTS ADDED BY THE JOINT COMMITTEE

The Joint Committee added projects 60–e–12 and 60–e–15, relating to the civilian atomic power program. The committee's comments and reasons for the Joint Committee action, are summarized below.

Project 60–e–12, alterations to Shippingport reactor facilities, $5 million

Adm. Hyman G. Rickover, Assistant Director for Naval Reactors, Division of Reactor Development, AEC, testified in support of this project before the subcommittee on March 23, 1959. Mr. McCone advised the Joint Committee that the Duquesne Power & Light Co. was still reviewing its power load requirements and that no report had been received in time to request approval of this project from the Bureau of the Budget, and therefore, the Commission had not yet been able to recommend this increase. The Commission has informed the Joint Committee that deferring authorization of these alterations until fiscal year 1961 might delay the testing of the advanced design core presently under development and the determination of the maximum power capability of the Shippingport plant by about 1 year. The Commission also stated that other ways of testing the new core without increasing the electrical power output of the plant had been investigated. The conclusion reached by the Commission's staff was that, although some information concerning the performance of the fuel elements in the core itself could be obtained by operating the reactor at 100,000 kilowatts output, the most significant information on overall core performance could not be obtained unless the plant should be operated at full power output of approximately 150,000 electrical kilowatts for statistically significant periods of time.

After considering the matter carefully, the Joint Committee concluded that this item should be included in the bill, but that the committee report should clearly indicate that the authorization should be

contingent upon corresponding action by the Duquesne Power & Light Co. to provide an increase in the necessary turbo-generating facilities at an estimated cost of approximately $15 million to it. If the Duquesne Power & Light Co. takes such action, the output of the Shippingport reactor could be increased from the 100,000 electrical kilowatts currently scheduled under the second core to 150,000 electrical kilowatts. The Joint Committee believes that the information thus obtained from operation at full power output could be of great value to the overall civilian power development program. It is understood that all information developed from the construction and operation of the Shippingport reactor will be made freely available to all of industry in order to take advantage of the technology and information developed through expenditure of Government funds.

The Joint Committee also directed that the committee report should make it clear that the increased energy output should not be subject to the provisions of section 44 of the Atomic Energy Act of 1954, as amended, the so-called preference clause. The original Shippingport reactor was authorized and commenced prior to the 1954 act, and therefore section 44 does not apply to the energy now produced at Shippingport. The additional energy produced under the proposed capacity increase would be delivered to Duquesne under the existing contract or amendment thereto and therefore not be subject to the provisions of section 44.

Project 60–e–15, power reactor of advanced design capable of utilizing nuclear superheat, to be undertaken either as a cooperative project or conducted solely by the Atomic Energy Commission, $11 million

Last year, fiscal year 1959, the Joint Committee authorized $750,000 for project 59–d–14. Under this project the AEC was directed to make a design and engineering study of a power reactor of advanced design capable of using nuclear superheat. This study was to be undertaken either as a cooperative project or conducted solely by the AEC.

The AEC made contracts under this authorization and has expended $250,000, leaving a balance of $500,000. Notwithstanding the fact that there has been a long history of negotiation between the AEC and the Puerto Rico Water Resources Authority for the location of a reactor in Puerto Rico, the Joint Committee in authorizing project 59–d–14 stated in its report last year:

> It is the committee's intention that the design study does not constitute a commitment for either construction or location of such a proposed reactor.

In this bill the Joint Committee has included project 60–e–15 which provides authorization of $11 million for detailed design and construction of a power reactor of advanced design capable of using nuclear superheat, to be carried on as a cooperative project or conducted solely by AEC.

The committee in authorizing project 60–e–15 does not intend to direct the AEC in the selection of a location for this reactor. The AEC has indicated that if the reactor should be constructed, it desired latitude of judgment in locating the reactor. It is intended that there should be no commitment to existing contractors under

project 59–d–14 and that the Commission shall exercise its best judgment to select the reactor design, contractor and reactor location.

Testimony also indicated that the final report under the design study would not be completed until approximately November 1, 1959. It is therefore understood that the Commission will thereafter proceed to evaluate expeditiously the design study and report, as well as all other nuclear superheat technology available to the Commission, and then, in the event the evaluation shows the concept to be technically feasible, proceed as expeditiously as possible with the necessary arrangements for the construction of a reactor utilizing nuclear superheat. The Joint Committee intends that close exchange of information should be obtained among all nuclear superheat programs, including the work at the national laboratories such as Argonne, the Northern States Power Co. reactor project and the above referenced design study in order that advancement may be made in this important field as rapidly as possible.

During the hearings the Joint Committee investigated the importance of the development of reactors which would generate superheated steam. Chairman McCone and others of the Atomic Energy Commission testified as to the importance of the development of nuclear superheat reactors. The testimony also indicated the particular importance of the development of nuclear superheat reactors relative to the U.S. program, since it is a natural extension of water reactor concepts on which the United States has already committed a major portion of its effort. Testimony was received concerning the possible major improvements in the economics of nuclear reactors through the use of the nuclear superheat concept. Testimony was also received relative to the importance of proceeding with the construction of nuclear superheat reactors, in addition to study and small-scale experimental work, in order to attain goals in this field. In view of these factors, the Joint Committee included this project in the bill.

Information released by the Russians during the Geneva Convention in the fall of 1958 indicated that the Russians are in the large-scale experimental stage and reportedly have initiated construction of at least one full-scale reactor utilizing nuclear superheat.

It is understood that the Commission will keep the Joint Committee fully and currently informed as to progress on this project.

C. COOPERATIVE POWER REACTOR DEMONSTRATION PROGRAM

Section 110 (pp. 10–14 of the bill) pertains to the cooperative power reactor demonstration program. Subsection (a) reduces amounts previously authorized by $20 million and subsection (b) authorizes a new amount of $55,500,000 for use in the Commission's power reactor demonstration program. In addition, $10 million is made available for waiver of charges for the use of nuclear fuels and heavy water, thereby bringing the total amount available for the program under subsection 110(b) to $65,500,000.

The amount of $55,500,000 compares with a net amount of $39,500,000 requested by the Atomic Energy Commission in sections 110, 111, and 112 of the AEC proposed bill (S. 1194 and H.R. 5106). (The sum of $49,500,000 was requested by these sections, but $10 million has been transferred to projects 60–e–13 and 60–e–14 of this bill.)

The $16 million increase from $39,500,000 to $55,500,000, as recommended by the Joint Committee is intended to cover the additional third round research and development assistance for reactor plants under subsection 110(c)(2) and assistance for the additional second round reactor plant under subsection 110(d)(2). Omitted from the bill are any funds for use by the Commission in the "construction grant" program which the Commission proposed.

Table I of the appendix to this report summarizes in table form the manner in which the amended amount of $135,113,000 previously authorized has been determined in subsection (a). Table II similarly indicates derivation of the $55,500,000 figure authorized by subsectoin (b) but it is intended that the Commission shall have discretion to allocate the funds within the $55,500,000 limit. It is recognized that, in order to have a dynamic and forward-looking program, a certain amount of flexibility is needed by the Commission to take advantage of the constantly changing technology and it is intended that the greatest possible advance shall be made in developing atomic power with the $55,500,000 authorized.

Although the Commission shall have flexibility in the allocation of the $55,500,000, it is intended that in the event the Commission solicits proposals and does not receive satisfactory proposals for a program of cooperative assistance for reactors included under subsection 110(c) for third round assistance, or for the two reactors included under subsection 110(d) for second round assistance, the Commission may proceed independently with these reactor projects as authorized by subsection 110(e).

Second round

Section 110 provides that funds appropriated to the Commission pursuant to authorizations contained in subsection (b) shall be available for the purpose of reinstituting and supplementing the second round of the power reactor demonstration program, as modified and contemplated by subsection 111(a)(1) of Public Law 85–162. Under the second round, in general, the Commission constructs and owns the power reactor and a cooperative or municipal organization furnishes the site and turbogenerating facilities.

Clause (1) of subsection (d) of the bill provides that one such reactor prototype may be a small power reactor which will be designed to make a significant contribution to the achievement of economical power in a small size nuclear powerplant. This reactor was requested in section 110 of the original AEC bill. The Joint Committee added a second reactor prototype in clause (2), subsection (d) providing that it may be in the intermediate size range, approximately 25,000 to 75,000 electrical kilowatts.

Third round

Subsection (c) of section 110 provides that funds appropriated to the Commission pursuant to the authorization of subsection (b) shall be available for the purpose of supplementing its third round power reactor demonstration program. Under the third round, in general, the Commission has been authorized to provide research and development assistance and to waive use charges, and construction funds for the reactor are furnished by the proposer, and the proposer then owns and operates the reactor.

In clause (1) of subsection (c) it is provided that one such plant may be a boiling water prototype reactor in the size range from 50,000 to 100,000 electrical kilowatts. This reactor was also originally requested by the Commission in section 110 of its bill. The Joint Committee added clause (2) to the effect that one such plant may be a prototype reactor in the intermediate size range, 25,000 to 75,000 electrical kilowatts. It is intended that the Commission solicit proposals for any second round and the third round reactors in accordance with the provisions of subsection 111(f) of Public Law 85–162 (except as provided in the last sentence of subsection 110(c) explained below), but the Joint Committee desires to leave the Commission flexibility in selecting the type of reactor, the contractors, and the site. The design studies completed under the authorization of last year's act should be useful in selecting reactor concepts and designs.

Unsolicited proposals

The last sentence of subsection 110(c), on page 12 of the bill, provides that the Commission is authorized to use funds, not to exceed $5 million in the aggregate, to provide research and development assistance in support of unsolicited proposals from the utility industry to construct nuclear powerplants. It is intended that this $5 million may be used to assist in the development of one or more power reactors. In addition to this $5 million research and development assistance the Commission is authorized to waive use charges for such proposed reactors, within the $10 million limit provided in subsection (b).

Construction grant

In section 110(b) of S. 1194 and H.R. 5106, the Commission requested authority to provide financial assistance toward the construction of one nuclear plant without regard to provisions of section 169 of the Atomic Energy Act of 1954, as amended. Section 169 of the act is entitled "No Subsidy" and provides that no funds of the Commission shall be employed in the construction or operation of licensed reactor facilities except under contract or other arrangement under section 31 of the act, which pertains to research and development assistance. The Commission has followed the practice of not using funds under the power demonstration program as contributions toward the construction cost of a reactor which would be privately owned.

During the course of the hearings and consideration of this bill, the Joint Committee considered three alternatives as to language and scope of the "construction grant" concept.

(1) In section 110(b) of the original bills requested by AEC (S. 1194 and H.R. 5106), the Commission requested authority to provide financial assistance toward the construction of one nuclear powerplant without regard to the provisions of section 169, with the proviso that the financial assistance toward construction should not exceed 50 percent of the capital cost of the entire nuclear powerplant. This proviso was included in each of the two subsequent alternatives.

(2) Following the hearings on May 8, 1959, the Commission, at the request of the committee, submitted alternative language for the "construction grant." This language was similar to that above, but with an additional proviso to the effect that the financial assistance toward construction should not exceed 75 percent of the amount by which the estimated cost of construction of the entire nuclear powerplant might

exceed the estimated cost of construction of a conventional powerplant of equal size.

(3) Thereafter, as another alternative, the AEC, at the request of the committee, submitted a variation of the 75 percent proviso so that it would relate to the differential in estimated cost between the nuclear reactor and related facilities as compared to the corresponding components of a conventional powerplant. In other words, under alternative No. (3), the 75 percent proviso would limit the grant to 75 percent of the excess construction costs between the reactor and the heat source for the conventional plant, rather than between the construction costs of the entire plants, including the turbogenerating facility. By letter dated May 23, 1959, the AEC informed the committee of difficulties in applying this alternative.

After carefully considering the matter, the Joint Committee decided not to include the authorization of the construction grant in the bill. Because of the different alternatives available to the committee and the uncertainty as to the effects of these alternatives, the Joint Committee concluded that the matter needed more study and review. Some members of the committee indicated opposition to the concept of construction grants, and others indicated approval of the concept if certain matters could be clarified in the future. With the understanding that the matter should be studied more thoroughly and might be reconsidered next year, the language requested by the Commission was not included in the bill.

High-temperature gas-cooled experimental power reactor

Subsection (f) of the section 110 provides that funds appropriated to the Commission under subsection (b) and authorized by the third round shall be available for use in a cooperative arrangement to provide research and development assistance in connection with the design, construction, and operation of an advanced, high temperature gas-cooled experimental power reactor in accordance with the basis for an arrangement described in the program justification data submitted by the Commission. In the basis and the program justification data, submitted by the Commission on February 26, 1959, the Commission indicated that a proposal had been received from General Dynamics and the Philadelphia Electric Co., with support from some 52 other participating private utilities. Under the basis of the proposed arrangement the Commission would furnish research and development assistance, up to a maximum of $14,500,000, and would waive use charges up to a maximum of $2,500,000, and the proposers would bear all other costs, including excess research and development above the $14,500,000 figure, construction costs estimated at $24,500,000, and excess operating costs for a 5-year period. The Joint Committee added a proviso to the authorization in subsection (f) to the effect that if there should be a unilateral abandonment of the project by one of the private parties for reasons other than a contract amendment approved by the AEC or certain causes beyond the control of the contracting parties and within their fault or negligence, the Commission shall be reimbursed for research and development expenditures except for the acquisition by the Government of property, patents or other value. By the addition of this proviso it was intended to protect the Government's investment and obtain such reimbursement in the event of abandonment by one of the private parties, and

at the same time to encourage the private parties to proceed with definite commitments for construction of the reactor.

Further discussion of the language and provisions of section 110 of the bill are contained in the section-by-section analysis portion of this report.

D. DESIGN AND ENGINEERING STUDIES

Section 113, on page 17 of the bill, provides that the Commission shall proceed with design and engineering studies to include certain reactor types, and to submit reports to the Joint Committee on Atomic Energy by April 1, 1960. In the past the Joint Committee has included design and engineering studies as line item projects in section 101 of the bill. The AEC staff has indicated that this might cause certain budgeting and accounting difficulties if plant and facility, rather than operating, funds should be intended. Therefore the Joint Committee has included such studies in the bill as a separate section, and it is contemplated that operating funds will be used by the Commission for such studies.

The Joint Committee considers such studies of great importance to future development of the program and it is anticipated that the Commission will request the necessary operating funds. In the committee print reported out by the subcommittee, the subcommittee estimated that $1 million might be an appropriate amount for the design study on the prototype reactor of a nuclear tanker, $500,000 for a design study of a reactor for remote military installations, and $2 million for design studies on other promising reactor types. In the case of the nuclear tanker reactor study, it is intended that the study will include preliminary design and cost estimates, in the same manner as the design studies carried out under project 59–d–13 of Public Law 85–590. The Joint Committee recommends that the Appropriations Committees provide the necessary funds for these important studies.

2. COOPERATION WITH EURATOM

Section 109 on page 10 of the bill authorizes to be appropriated to the Atomic Energy Commission the sum of $7 million for research and development assistance to carry out the purposes of section 3 of Public Law 85–846, the Euratom Cooperation Act of 1958, in addition to $3 million previously authorized.

The Atomic Energy Commission originally requested authorization of $14 million in section 109 of the bill. However, for the reasons set forth hereafter, the Joint Committee decided, after careful consideration, that $7 million would be sufficient at this time, and the Joint Committee intends to review the status of the program again early in calendar year 1960.

In taking this action, the Joint Committee does not intend to indicate a lack of interest or support for the Euratom program. The committee, on the contrary, believes that close cooperation with Euratom in the joint program can help advance nuclear reactor technology and atomic power development, for the benefit of both the European Community and the U.S. reactor suppliers.

The testimony before the committee indicated that the program has not moved forward as rapidly as its supporters had hoped that it would. Commissioner Floberg frankly stated that of the $3 million authorized and appropriated by the Congress last year, $1 mil-

lion would probably prove to be sufficient during this fiscal year. The testimony indicated that only $500,000 of the $3 million appropriated might be obligated by June 30, 1959.

The testimony indicated that, for various reasons (such as increasing stockpiles of coal in Western Europe, discovery and development of oil and gas in the Sahara Desert of North Africa, a minor recession in Western Europe and consequent slowdown in industrial expansion), there had developed among European utilities during the last year a sense of less urgency for the Euratom program. However, most witnesses stated that these were apparently short-term considerations, that the Euratom governmental representatives still considered the program important, and that the long-range necessity of developing atomic power for Western Europe still remains.

In response to an AEC-Euratom invitation of December 23, 1958, over 200 proposals and letters of intent have been received for the research and development program. These proposals have been made by reactor designers, equipment suppliers and laboratories in both the United States and Western European countries. It is understandable that it has taken some time for the Joint Board to evaluate these proposals fully and carefully before committing funds. In particular it is necessary for the U.S. representatives, through the Commission, to make sure that the research and development sponsored under the Euratom program does not unnecessarily overlap and duplicate research and development work carried out in the United States.

The Joint Committee intends that the Euratom research and development funds be committed wisely so as to supplement and enhance the U.S. program, as well as provide advancing technology for the benefit of the European Community.

It is understood that the Joint Board is now ready to commit the first of the available funds for the research and development program and to accept approximately 4 or 5 of the 200 proposals which it has received. The testimony indicated that the research and development program will expand rapidly as the Joint Board evaluates and accepts more of the proposals now pending before it.

All of the funds committed so far have been for the general research and development program. As for the timetable leading toward construction of the reactors, the Commission indicated that on May 28, 1959, letters of intent were received from European utility companies. Returns actually exceeded expectations in that letters of intent were received for five reactor projects to be completed in 1963 and two in 1965. Letters of intent were received from utilities in Belgium, France, Germany, Italy, and the Netherlands (one proposal being a joint French-Belgian proposal).

The present schedule provides that definitive proposals for the 1963 reactors shall be submitted by September 1, 1959, and for the 1965 reactors by October 1, 1959. Thereafter the Joint Board for Reactor Selection (consisting of representatives of both Euratom and the U.S. Atomic Energy Commission) will evaluate the proposals and select those reactor projects which it believes worthy of support.

The testimony indicates that the Commission hopes to submit to the Joint Committee and the Congress in January or February, 1960, requests for authorization of funds for certain specific reactor projects, in order that contracts may be let and construction started in April 1960.

Under this timetable, therefore, the Joint Committee and the Congress must review the Euratom program again early in calendar year 1960. Under these circumstances the Joint Committee felt it appropriate that only $7 million research and development assistance be authorized at this time for the general research and development program, and that more funds could be requested and considered at the time the specific reactor projects are submitted to the Joint Committee in January or February.

In the meantime the Joint Committee hopes that the Euratom program will go forward rapidly and continue to gain momentum. It is believed that closer liaison is needed between the Euratom officials and the utility companies of Western Europe who must submit the reactor proposals. In addition, some U.S. manufacturers have indicated that they are not satisfied with the liability and indemnity arrangements planned by the Euratom Community, particularly with respect to the recourse provisions in the proposed liability conventions.

The Joint Committee is also concerned with the foreign liability problem and will consider this matter very carefully before authorizing funds for reactor projects.

The Joint Committee intends to follow these problems and developments closely in the hope that they may be resolved by the time the Congress meets in January 1960.

For these reasons the Joint Committee recommends that only $7 million be authorized by section 109 of the bill at this time, with the understanding that further consideration will be given to the Euratom program next session. As required by section 3 of the European Cooperation Act of 1958, funds made available by the United States for the research and development program must be matched by equivalent funds from the European Community.

3. MILITARY REACTOR PROGRAM

In addition to the projects in the bill requested by the AEC relating primarily to development of military reactors (projects 60–e–2, 60–e–6, 60–e–7, 60–e–8, and 60–e–9), the Joint Committee decided that additional emphasis should also be given to two other phases of the program. Accordingly, the Joint Committee added project 60–e–11, described below, and also section 113(b), a design study for a reactor for remote military installations, which has been described above.

Project 60–e–11, natural circulation test plant, National Reactor Testing Station, Idaho, $18,500,000

Adm. Hyman G. Rickover also testified in support of this project before the Subcommittee on Legislation on March 23, 1959. He testified that studies indicate that it is feasible to develop a pressurized water reactor plant for submarine application in which the reactor coolant would be circulated by natural convection, eliminating the need for large coolant pumps, coolant check valves, and associated electrical power equipment required in current designs of nuclear submarines. Successful development of this type of reactor could result in substantial improvement in simplicity, reliability, and inherent safety of naval plants. These potential improvements are highly desirable in the opinion of the Joint Committee, particularly in nuclear submarines which may operate in Arctic regions. Admiral Rickover

further testified that, if the authorization is not received at this time, a year might be lost in this new development.

Dr. Frank K. Pittman, Director of the Division of Reactor Development, AEC, testified that the project has been reviewed and found to be technically feasible by his Division and that it offers promise for greater simplicity and increased characteristics of inherent safety. Dr. Pittman stated that a recommendation was made to the Commission to proceed with the project.

Chairman McCone in testimony on February 27, 1959, stated that the Commission felt that the project offers great prospects, although it was thought that time would not be lost by deferring construction authorization for 1 year. Commissioner Floberg in testimony on March 23, 1959, stated that at the time the Commission considered the project it was felt that the margin of delay would only be a few months if the authorization should be delayed until next year and a special request for authorization might be made by the Commission early in the next session.

The Department of Defense has specified a requirement for this project.

After considering all the evidence, the Joint Committee decided that this project is of great importance, and therefore recommended including project 60–e–11 in this bill in order that the Commission may proceed with the construction as soon as possible.

4. PHYSICAL RESEARCH PROGRAM

At the request of the Joint Committee, the AEC furnished a list of construction items recommended by its Division of Research, together with action taken on these items at the Commission level and by the Bureau of the Budget. After careful review of this list, the Joint Committee selected two projects—in addition to those approved by the Budget Bureau—which the committee believes are sufficiently urgent in terms of program needs to justify commencement of construction during fiscal year 1960.

Project 60–g–4, physics building, Lawrence Radiation Laboratory, California, $2 million

The physics building at the Lawrence Radiation Laboratory in California is needed for office space, laboratory areas and special research facilities to accommodate the activities of 200 to 250 scientific personnel. The requirement for the physics building results from: (1) overcrowded conditions in existing physics areas; (2) additional space requirements to accommodate a contemplated staff and program growth; (3) the need for a data and film processing center adequate to handle both the current and future work volume in connection with the high energy accelerator and bubble chamber at Berkeley. The present central research laboratory, which houses most of the direct physics staff, is taxed beyond capacity. It was equipped to accommodate 190 people and the current complement in the building is 280.

Project 60–g–5, 10 Mev. tandem Van de Graaff accelerator, Oak Ridge, Tenn., $2,400,000

This project provides for the procurement of a 10 Mev. tandem Van de Graaff accelerator at a cost of approximately $1 million, and the

construction of a building at a cost of approximately $1,400,000 to house the accelerator and associated experimental equipment. The high voltage laboratory at Oak Ridge, to which this project is an addition, during the short period of its existence has grown to become one of the leading centers for research into the structure and interactions of atomic particles at high energy levels. As experiments have become increasingly complex, the preparation and setup times are becoming a major effort of the experimenter and the availability of the existing accelerators has been increasingly in demand. On one of the existing machines, for example, an individual experimenter has the use of the machine for only 1 week out of about every 3 months. The new accelerator would assist measurably in meeting this pressing need of scientists at Oak Ridge and in increasing the output of technical and scientific information to the advancement of the overall program.

Unfunded fiscal year 1959 projects

Last year the Joint Committee recommended and the Congress authorized in Public Law 85–590 a number of physical research construction projects not originally requested by the Commission, but which were considered essential by the committee to meet present and future requirements in the program. These were included in Public Law 85–590, section 101 as projects 59–e–3 through projects 59–e–15. Work has proceeded on design and construction of some of these projects, but work has not yet commenced on the following three projects:

(1) Chemistry hot laboratory, Argonne National Laboratory (project 59–e–7), $4,400,000.

(2) Van de Graaff accelerator, Argonne National Laboratory (project 59–e–13), $2,500,000.

(3) Research reactor, Ames Laboratory (project 59–e–15), $3,800,000.

These projects have not yet been funded as a result of priorities established by the AEC within the $15 million included in last year's appropriation by the Congress for projects 59–e–1 and 59–e–3 through 59–e–15. The House Appropriations Committee, together with the Joint Committee on Atomic Energy, expressed the firm intent that these projects go forward and specifically listed them in their reports. The Appropriations Committee expressed the opinion that—

> There will be sufficient slippage in the total plant acquisition and construction program to permit full financing of all items (in the group of 14 projects) that can be put under construction in fiscal year 1959.

The AEC has advised the Joint Committee that funds may not be available to it for these projects during fiscal year 1960 as now programed.

In view of the demonstrated need for stepping up our efforts in the field of physical research, and the clearly expressed intent of Congress last year, the Joint Committee believes these three projects should go forward without further delay and recommends that the Commission request and the Congress make available the necessary funds to fulfill this need.

The Joint Committee also believes that increased operating funds should be made available to meet the growing needs of the physical research program, and concurs in the views of the AEC General

Advisory Committee that the operating budget (exclusive of Project Sherwood) should be increased from the presently contemplated $114 million to $125 million.

Stanford accelerator project

The Joint Committee received a request from the Atomic Energy Commission on May 27, 1959, for authorization of $105 million for construction of a 2-mile linear electron accelerator near Stanford University, Calif. Authorization of this project has not been included in this bill. The committee concluded that more information and explanation is needed before it can recommend to the Congress that it authorize this project, and Chairman Anderson has instructed the staff to try to arrange hearings in late June or early July.

5. BIOLOGY AND MEDICINE PROGRAM

The Atomic Energy Commission recommended only one project, project 60–h–1, installation for support of biomedical research projects in atomic energy (p. 5 of the bill), $2 million.

After review of the testimony and further information obtained by the committee staff, the Joint Committee concluded that this amount should be increased from $2 million to $3 million, as recommended by the AEC Division of Biology and Medicine and by the Commission to the Bureau of the Budget. By use of the extra $1 million, additional animal research installations can be constructed and specialized equipment procured to carry out important research into the nature and biological effects of radioactive fallout on man. The Joint Committee held extensive hearings on this subject in 1957, and as a result of these hearings recommended a step-up in the Commission's research program in this area. Followup hearings held by the committee in May 1959 on fallout have tended to confirm this view, particularly in light of extensive public concern over this question and the need for development of additional data.

Section-by-Section Analysis

Section 101 of the bill authorizes to be appropriated to the Atomic Energy Commission in accordance with the provisions of section 261a(1) of the Atomic Energy Act of 1954, as amended, the sum of $165,400,000 for acquisition or condemnation of any real property or any facility, or for plant or facility acquisition, construction or expansion. The format of section 101 is similar to section 101 of Public Laws 84–141, 84–506, 85–162 and 85–590, the AEC authorization acts for the 4 prior fiscal years.

The Atomic Energy Commission originally requested authorization of $115,500,000 in section 101. The Joint Committee, by this bill, recommends increasing this amount to $165,400,000 by additions of projects 60–e–11, 60–e–12, 60–e–15, 60–g–4, and 60–g–5, and by increasing project 60–h–1.

As originally submitted the bill did not contain project numbers. Before introduction, and with the consent of the Commission, project numbers were written in by the Joint Committee staff, at the direction of Chairman Anderson and Vice Chairman Durham, who then introduced the bills. It is intended that the projects be related, as in previous years to the analysis, of the proposed bill submitted by

AEC, and other backup and explanatory materials furnished by the Commission during the course of the hearings.

The Joint Committee on Atomic Energy, and its Subcommittee on Legislation, considered each project in section 101 very carefully and added only those projects it considered necessary for the atomic energy program. Additional information concerning the added projects may be found above under the heading of "Comments by the Joint Committee."

Section 102 of the bill provides limitations similar to those in the three prior authorization acts. Subsection (a) provides that the Commission is authorized to start projects set forth in certain subsections of section 101 only if the current estimated cost of the project does not exceed by more than 25 percent the estimated cost for that project set forth in the bill. Subsection (b) of section 102 provides similar limitations for projects in other subsections of section 101, except that the increase may not exceed 10 percent of the cost shown in the bill.

Subsection (c) of section 102 provides limitations on general plant projects authorized by subsection 101(1), similar to the limitations set forth in previous authorization acts for general plant projects.

Section 103 of the bill authorizes to be appropriated funds for advance planning, construction design, and architectural services in connection with projects which are not otherwise authorized by law, and the Commission is authorized to use funds currently or otherwise available to it for such purposes.

Section 104 of the bill authorizes to be appropriated funds necessary to restore or to replace plants or facilities destroyed or otherwise seriously damaged, and the Commission is authorized to use funds currently or otherwise available to it for such purposes. Under this provision the Commission may construct replacement facilities without having to come back to the Congress for specific authorization.

Section 105 provides that in addition to the sums authorized to be appropriated by section 101, there are authorized to be appropriated to accomplish the purposes of this act such sums as may be currently available to the Commission. Under this provision, the Commission may continue to use funds for projects which have been authorized by the Congress in prior years. It is the intent of the Joint Committee that the Commission shall continue to follow the practices of prior years and that the authorization of this section shall apply only to construction funds currently available and shall not include any operating funds which may be available to the Commission.

Section 106 of the bill provides that funds authorized to be appropriated or otherwise available by this act may be used to start any other new project for which an estimate was not included in the act if it be a substitute for a project or a portion of a project authorized in subsections (a), (b), (c), and (d) (special nuclear material and atomic weapons). The Commission is required to make certain certifications, as specified in subsections (a), (b), and (c) of section 106

Section 107 of this bill amends section 101 of Public Law 85–590, the AEC Authorization Act for fiscal year 1960, by amending projects 59–d–10, 59–e–11, and 59–d–12. Subsections (a) and (b) of section 107 amending projects 59–d–10 and 59–e–11 were requested by the Commission.

Section 107(a) of the bill, as requested by the Commission, amends project 59–d–10 authorized last year as gas-cooled power reactor, $51 million, to read "project 59–d–10, flexible experimental prototype gas-cooled reactor, $30,000,000." The Commission request last year for $51 million was based on the estimated cost of a prototype power reactor of about 40,000 net electrical kilowatts designed to serve as a prototype for a large-scale reactor, either of enriched or natural uranium, and to provide flexibility for testing gas-cooled reactor fuel elements under a variety of test conditions. During the past year, design work performed by the Commission indicates that prototype data for power reactors and flexible test conditions can be obtained from a reactor facility designed to generate approximately 26,000 net electrical kilowatts, at an estimated cost of approximately $30 million. It is intended that this project will proceed in accordance with the authorization contained in subsections (b), (c), and (d) of section 110 of Public Law 85–590.

Subsection (c) of section 107 was added by the Joint Committee, and it amends project 59–d–12, design and engineering study of heavy water moderated power reactor, to change the scope from "design and engineering study," to "design and development," and increases the amount authorized from $2,500,000 to $4,500,000. By use of the words "and development," it is not intended to indicate a commitment at this time for construction of the reactor, nor that plant and facility funds must be used for this project. If the Commission so desires, it may use operating funds to carry out such development work, and it is not intended that this amount be a limit on other development work being carried out by the Commission on heavy water moderated reactors. By amending this project, no commitment is intended for existing contractors under project 59–d–12 and it is intended that the Commission shall have discretion and shall execute its best judgment in selecting contractors to carry out the development work authorized by this amendment. It is anticipated that the Commission will keep the Joint Committee fully and currently informed of further progress on this project.

AEC has indicated that this development work will include experiments to obtain the required design information for heavy water natural uranium power reactors. Examples of the experimental work to be performed, it is understood, will include critical experiments to determine reactivity data for natural uranium assembles and the development and test of natural uranium fuel elements.

It is recognized and intended that this project continue to provide a means of cooperation with other countries interested in natural uranium-heavy water reactors.

Section 108 of the bill amends the two previous AEC authorization acts by rescinding authorization for certain projects, except for funds heretofor obligated. Such rescissions were requested by the Atomic Energy Commission.

Section 109 of the bill authorizes to be appropriated to the Commission, in accordance with the provisions of section 261(a)(2) of the Atomic Energy Act of 1954, as amended, the sum of $7 million, in addition to the $3 million previously authorized, for carrying out the purposes of section 3 of Public Law 85–846, the Euratom Cooperation Act of 1958. Section 3 of that law concerns research and development assistance under the joint program of the United States and

Euratom, having as a goal a total installed capacity of approximately 1 million kilowatts of electricity by December 31, 1963, except that two reactors may be selected to be in operation by December 31, 1965. Section 3 contains a proviso to the effect that the community must authorize an equivalent amount of funds for use in the cooperative program of research and development to match funds provided by the United States.

Section 110 of the bill pertains to the cooperative power reactor demonstration program. Subsection (a) further amends section 111 of Public Law 85–162, the AEC Authorization Act for Fiscal Year 1958 by decreasing the amount previously authorized by $20 million. Table I of the appendix indicates reactor projects contemplated, although the Commission may allocate within the total amount authorized, if requirements of law are met. The Joint Committee believed that it would be preferable to begin with a new authorization this year. Subsection (a) also amends the figure in clause 2 of subsection (a) of section 111 of Public Law 85–162 by increasing the amount available to advance the technology of the fast breeder concept from $2,750,000 to $3,600,000. It is the committee's intent to continue the support of research and development on the fast breeder concept for fiscal year 1960 in the same manner as provided in fiscal years 1958 and 1959, as interpreted in the legislative history. The additional $850,000 would cover fiscal year 1960 obligations. Subsection (a) also amends clause 3 of that subsection by extending the date for approving proposals under the third round from June 30, 1959, to June 30, 1960. It is understood that the dates for completion of construction of reactors under the third round may be appropriately extended by the Commission.

Subsection (b) of section 110 authorizes to be appropriated to the Commission under the terms and conditions of section 111 of Public Law 85–162, as amended, the sum of $55,500,000 for use in a program not to exceed $65,500,000, to be available for the Commission's cooperative power reactor demonstration program. The $55,500,000 authorization is available for all the various types of reactors and assistance further listed in subsections (c) and (d), (e) and (f) of the section. The incremental $10 million follows the same language as in subsection (a) of section 111 of Public Law 85–162, and is intended to be used similarly for waiver of charges for the use of nuclear fuels and heavy water.

By use in subsection 110(b) of the words "under the terms and conditions of section 111 of Public Law 85–162, as amended," it is intended to incorporate, as to the $55.5 million authorized, all of the terms and conditions of said section 111, including the 45-day review period by the Joint Committee under subsection 111(b) of Public Law 85–162. As stated below, the Joint Committee has reviewed the proposed cooperative arrangement authorized under subsection 110(f) of this bill and thus the requirements of said subsection 111(b) of Public Law 85–162 have been met as to that proposed arrangement. Also, as explained hereafter, the "unsolicited proposals" under subsection 110(c) of this bill are exempted from the advance announcement requirements of subsection 111 (f) of Public Law 85–162. The authorization of waiver of use charges in the last sentence of subsection 110(b) of this bill supplements the waiver authority under subsections 111 (a) and (c) of Public Law 85–162. Also, the next to last

sentence of subsection (b) provides that its requirements shall be without regard to and in lieu of clause 3 of subsection (a) of section 111 of Public Law 85–162. Otherwise the terms and conditions of section 111 of Public Law 85–162, as amended by Public Law 85–590, are fully applicable. The most important requirement is the 45-day review period by the Joint Committee, as required under subsection 111(b) of that act, which will apply to all future proposed arrangements for which the basis has not yet been submitted to the Joint Committee.

The second sentence of subsection (b) provides that no funds or waiver of use charges authorized by this subsection shall be available on projects already approved under the power demonstration reactor program or other nuclear power projects already under construction. This limitation is intended to apply to funds authorized by this subsection, without regard to similar requirements of clause (3) of subsection (a) of section 111 of Public Law 85–162. The final sentence of subsection (b) provides that in connection with such program the Commission is authorized to waive its charges for the use of special nuclear materials and heavy water for research and development and for a period of not more than 5 years after the initial criticality of the reactor. As explained above, a $10 million limitation is applicable to such waiver of use charges.

Subsection (c) of section 110 provides that funds appropriated to the Commission pursuant to the authorization contained in subsection (b) shall be available for the purpose of supplementing its third round power reactor demonstration program. It is anticipated that most of the proposals under the third round will come from private organizations, but at the request of the Commission, the subsection provides that financial assistance may be made available "to public and private organizations," in the event a satisfactory proposal is received from a public organization. The subsection provides that the Commission shall consider but not be limited to reactor types listed in clause (1) and clause (2).

The final sentence of subsection 110(c) provides that the Commission is authorized to use funds not to exceed $5 million for research and development assistance in support of unsolicited proposals from the utility industry to construct nuclear powerplants. This authorization is provided without regard to subsection (f) of section 111, Public Law 85–162, which would require the Commission to make public announcement of each particular reactor project that it considers technically desirable for construction, and to set reasonable dates for submission, approval of the proposal and negotiation of the basis for the arrangement, and commencement of construction. Except for such $5 million, the Commission shall follow the procedure of subsection (f) of section 111 of Public Law 85–162 in obtaining proposals under subsections (c) and (d) of the bill.

By use of the words "established reactor technology" in subsections 110(c) and (d), it is intended to mean that the basic features of the reactor (such as heat transfer, control, fuel cycle, fuel form, and materials) have been shown to be technically feasible through the operation of at least a reactor experiment. It is not intended to limit such designs precisely to the design and experimental values demonstrated in operating experiments. It is intended that reactor concepts based upon "established reactor technology" will incorporate improve-

ments by reasonable extrapolation of the experimental data to advance the reactor art, and may take into account development work which will proceed with the preparation of the design of the prototype.

Subsection (d) of the bill provides that funds appropriated to the Commission pursuant to the authorization of subsection (b) shall be available for the purpose of reinstituting and supplementing the second round of the power reactor demonstration program. It is intended that the Commission shall follow the provisions of section 111 of Public Law 85–162 in connection with the second round, as modified by this bill, and all of the legislative history of said section 111 is intended to be incorporated into this report and made applicable to the two new second round reactors. Certain types of reactors which the Commission shall consider are set forth in clause (1) and clause (2) of subsection (d) as discussed previously in this report.

Subsection (e) of section 110 provides that in the event the Commission solicits proposals under subsections (c) or (d) and no satisfactory proposal is received, the Commission may, if the project is still deemed desirable, proceed with design, construction, and operation of such prototype at a Commission installation, and funds authorized by subsection (b) shall be available for such purposes. Section 112 of the bill (explained hereafter) sets forth certain provisions as to disposition of the electrical energy, cooperation with organizations and period of operation of any such reactor constructed by the Commission under subsection 110(e) at an AEC installation.

Subsection (f) of section 110 provides that funds appropriated to the Commission pursuant to the authorization of subsection (b) and authorized for the third round shall be available to the Commission for use in a cooperative arrangement to provide financial assistance for research and development in connection with the design, construction, and operation of an advanced, high temperature gas-cooled experimental power reactor in accordance with the basis for an arrangement described in the program justification data submitted by the Commission as part of its authorization proposal for fiscal year 1960. The requirements of subsection (b) of section 111 of Public Law 85–162, pertaining to the 45-day review period by the Joint Committee have been met with respect to this arrangement inasmuch as the basis was included in the program justification data previously submitted to the Joint Committee in support of the authorization legislation recommended by this report. The Joint Committee has reviewed such basis and program justification data and has received testimony concerning this reactor proposal from General Dynamics Corp. and the Philadelphia Electric Co. It is intended that the cooperative arrangement shall be in accordance with such basis, as modified by the legislative history. In May 1959 the Joint Committee received a letter from the Commission stating that General Dynamics had agreed to relinquish claims to title of previously filed patent applications.

The Joint Committee added a proviso to subsection 110(f) that in the event the parties enter into such cooperative arrangement and proceed with research and development and there is a unilateral abandonment of the research and development or of the construction for reasons other than those listed in clauses (a) and (b) of subsection (f), the Commission shall be reimbursed by the party abandoning the project for its expenditures for research and development under the

arrangement except to the extent that the Commission determines that any such expenditures have resulted in the acquisition by the Government of property, patents, or other value.

It is intended by the exception at the end of the proviso that the abandoning party may receive an offset for rights or value which may be obtained by the Commission as a result of its research and development expenditures. Under clause (a), included in the subsection, it is provided that reimbursement shall not be required if the abandonment should be under a contract amendment approved by AEC. Under the requirements of subsection 111(b) of Public Law 85–162 any such contract amendment must be submitted to the Joint Committee on Atomic Energy for a 45-day review period. Clause (b) of the subsection provides that reimbursement shall not be required if the abandonment is for causes beyond the control of the contracting parties and without their fault or negligence, including inability to obtain necessary licenses or regulatory approvals or adequate liability coverage. It was concluded that the parties should not be penalized if the project should be abandoned for such causes.

It is not intended to establish a right of the contracting parties to abandon the project, or to preclude any rights of the contracting parties, or any alternative rights which the Commission may have, including specific performance of the contracts by the contracting parties.

Section 111 of the bill authorizes the Commission to enter into cooperative arrangements in connection with the experimental low-temperature process heat reactor authorized under project 60–e–14 of this bill. This section was requested by the Atomic Energy Commission in order that it might enter into a cooperative arrangement with the Department of Interior in connection with its saline water program, or with some other party for development, construction, and operation of this experimental reactor if it found it advisable to do so. Under the language it would also be possible to construct and operate the reactor in cooperation with a private or public organization, or at an AEC installation.

Section 112 of the bill provides that in the event the Commission constructs a power reactor under project 60–e–15 of section 101 or under subsection 110(e) at an AEC installation, certain provisions shall apply. These are similar to the provisions of section 110 of Public Law 85–162, and it is intended that the legislative history of that act shall be incorporated into the language of section 112 of this bill.

Section 113 pertains to design and engineering studies and provides that the Commission shall proceed with certain studies and submit reports to the Joint Committee on Atomic Energy by April 1, 1960. As explained elsewhere in the report, it is intended that operating funds may be used for carrying out the purposes of section 113.

Section 114 of the bill amends subsection 153(h) of the Atomic Energy Act of 1954, as amended, by striking out the date September 1, 1959, and inserting in lieu thereof the date, September 1, 1964. The effect of this amendment is to extend for another 5 years the compulsory licensing provisions of section 153 of the Atomic Energy Act and to provide that the provisions of that section shall apply to any patents, the application for which shall have been filed before September 1, 1964. On April 22 and 23, 1959, the Joint Committee held hearings on atomic energy patent matters and considered a bill proposed by the

Atomic Energy Commission. Such bill would amend other sections of chapter 13 of the act pertaining to patents and inventions. The Joint Committee has not yet had time to consider all of the provisions of such proposed bill, but it is not intended by section 114 of this bill to indicate that the Joint Committee will not further consider the AEC proposed bill concerning patents and inventions. The Joint Committee may desire to recommend to the Congress further amendments to the patent provisions of the Atomic Energy Act at the time this bill is considered on the floor of the House or Senate, or in a separate "omnibus" bill this session to amend various sections of the Atomic Energy Act.

APPENDIXES

TABLE I.—*Sec. 110(a). Cooperative power reactor demonstration program amendment to amounts previously authorized*

Project	*Amount*
1st round invitation:	
Power Reactor Development Co	0
Consumers Public Power District of Nebraska	$50, 178, 000
2d round invitation:	
Rural Cooperative Power Association, Elk River, Minn	9, 397, 000
City of Piqua, Ohio	10, 832, 000
NDA—Chugach Electric Association	17, 384, 000
Postconstruction operating expenses	7, 994, 000
Total	45, 607, 000
3d round invitation:	
Northern States Power Co., Minneapolis, Minn	8, 500, 000
Carolinas-Virginia Nuclear Power Associates, Parr Shoals, S.C.	13, 905, 000
East Central Nuclear Group and Florida West Coast Nuclear Group	11, 646, 000
Total	34, 051, 000
Research and development on fast breeder technology	3, 600, 000
Balance not applied	1, 677, 000
Total as amended by sec. 110(a)	135, 113, 000

TABLE II.—*Sec. 110. New authorization for cooperative power reactor demonstration program*

3d round:	
Sec. 110(c):	
Boiling water prototype	$3, 000, 000
Intermediate size prototype reactor	8, 000, 000
Unsolicited proposals	5, 000, 000
Sec. 110(f): Advanced, high temperature gas-cooled experimental power reactor	14, 500, 000
2d round: Sec. 110(d):	
Small power reactor	10, 000, 000
Intermediate size prototype reactor	10, 000, 000
Additional amount for 2d or 3d round, or AEC construction under sec. 110(e)	5, 000, 000
Total	55, 500, 000

CHANGES IN EXISTING LAW

In accordance with clause (3) of rule XIII of the Rules of the House of Representatives, changes in existing law recommended by the bill accompanying this report are shown as follows (deleted matter is shown in black brackets and new matter in italic):

PUBLIC LAW 85–590

AN ACT To authorize appropriations for the AEC in accordance with section 261 of the Atomic Energy Act of 1954, as amended, and for other purposes

* * * * * * *

SEC. 101.— * * *

(d) REACTOR DEVELOPMENT.— * * *

10. [Project 59–d–10, gas-cooled power reactor, $51,000,000] *Project 59–d–10, flexible experimental prototype gas-cooled reactor, $30,000,000.*

* * * * * * *

12. [Project 59–d–12, design and engineering study for heavy water moderated power reactor, $2,500,000] *Project 59–d–12, design and development, heavy water moderated power reactor, $4,500,000.*

(e) PHYSICAL RESEARCH.— * * *

11. [Project 59–e–11, high flux research reactor, Brookhaven National Laboratory, design, engineering and advanced procurement, $1,000,000] *Project 59–e–11, high flux research reactor, Brookhaven National Laboratory, $10,000,000.*

PUBLIC LAW 85–162

AN ACT To authorize appropriations for the AEC in accordance with section 261 of the Atomic Energy Act of 1954, as amended, and for other purposes

SEC. 101.— * * *

(e) REACTOR DEVELOPMENT.— * * * [Project 58–e–12, liquid metal fuel reactor experiment (LMFRE, $17,500,000)] * * *

SEC. 111. COOPERATIVE POWER REACTOR DEMONSTRATION PROGRAM.—(a) There is hereby authorized to be appropriated to the Atomic Energy Commission, in accordance with the provisions of section 261 a. (2) of the Atomic Energy Act of 1954, as amended, the sum of [$155,113,000] *$135,113,000* for use in a program not to exceed [$175,113,000] *$155,113,000* subject to the following conditions:

* * * * * * *

(2) Funds in the amount of [$2,750,000] *$3,600,000* may be expended for research and development in Commission laboratories to advance the technology of the fast breeder reactor concept.

(3) The date for approving proposals under the third round of the power demonstration reactor program shall be no later than [June 30, 1959] *June 30, 1960* and no funds authorized for the third round shall be expended on projects approved under the first or second rounds of

such program or on other nuclear power projects already under construction.

PUBLIC LAW 84–506

AN ACT To authorize appropriations for the AEC for acquisition or condemnation of rail property or any facilities or for plant or facility acquisition, construction, or expansion, and for other purposes

SEC. 101.— * * *

(d) PHYSICAL RESEARCH [Project 57–d–3, forty-eight-inch heavy particle cyclotron, Oak Ridge National Laboratory, $459,000]

PUBLIC LAW 83–703

THE ATOMIC ENERGY ACT OF 1954, AS AMENDED

SEC. 153. NONMILITARY UTILIZATION.— * * *

(h) The provisions of this section shall apply to any patent the application for which shall have been filed before [September 1, 1959] *September 1, 1964.*

○